The Automobile

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Emerson Plant Work Progressing

Deliveries Started to 21 States —Price Increased to $545 for Full Equipment

Kingston, N. Y., Feb. 24—At the plant of the Emerson Motors Co., Inc., it was learned to-day that delivery of Emerson cars started the last week in January and that sixty-nine have been delivered to date. These cars have gone into twenty-one different States and carload shipments have been made to such States as New York, Pennsylvania, Texas, North Carolina, and South Carolina. There were approximately eighty Emerson cars in different stages of completion on the assembly floor of the factory to-day. Of the total of 100 employees, eighty-five are engaged in the factory.

The price of the Emerson has been increased from $395 without equipment to $545 with equipment. This equipment includes electric starting and lighting; speedometer; demountable rims; top; windshield; tire carrier; and 30 by 3½ in. tires all around.

Orders for Parts

A look through the orders of the purchasing department showed to-day that orders with specifications have been placed for parts as follows: Wheels, 5000 sets; front and rear axles, 5000 sets; tire pumps, 10,000; gearsets, 1000; carburetors, 5000; steering sets, 1000; radiators, 500; demountable rims, 5000 sets; and there were other ordered specifications showing the extent to which the company is proceeding in its manufacturing problem.

At the factory work of getting all of the departments installed is progressing. The tool department is approximately half filled with new machinery and the purchasing department showed orders for additional machinery for it. The engineering department is going ahead with its own plans. Negotiations are under way with regard to purchasing additional ground adjoining the present factory.

J. W. Wellington of Sandusky, Ohio, has become superintendent of production. He was formerly the owner of the Mathews Engineering Co., Sandusky.

J. T. Beadle has been appointed purchasing agent. Mr. Beadle was formerly connected with a Jackson, Mich., company.

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Pierce-Arrow Earns $4,000,000

Buffalo, Feb. 26—The Pierce-Arrow Motor Car Corp. in 1916 earned over $4,000,000 after all depreciation charges. This is equivalent to $12.80 a share on the 250,000 shares of common stock outstanding, no par value, after allowing for 8 per cent dividend requirements on the $10,000,000 preferred stock outstanding. Profits of $4,000,000 in 1916 compare with $4,301,000 in 1915. Comparison of earnings in recent years is made below:

1916 calendar year	$4,000,000
1915 calendar year	4,301,000
1914, 18 months period	1,714,000
1913, June 30 year	1,464,000
1912, June 30 year	2,142,000

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R. E. Olds Forms Tractor Company

Tampa, Fla., Feb. 24—R. E. Olds, president of the Reo Motor Co., Lansing, Mich., will organize a $1,000,000 corporation to manufacture farm tractors on a site between Tampa and Oldsmar, the new city which Mr. Olds is creating at the head of Tampa Bay. The plant will employ 500 men at the start and will build for Southern trade in particular.

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Ceylon Duty 100 Per Cent Ad Valorem

Colombo, Feb. 18—Automobiles imported into Ceylon are now subject to a duty of 100 per cent ad valorem, the new rate becoming effective Feb. 12. The duty on automobiles entering Ceylon was recently increased from 5½ to 33 1/3 per cent ad valorem.

Standard Parts Buys Bock Bearing

Latter Remains in Toledo—W. E. Bock Becomes S. P. Director

Cleveland, Feb. 24—The Standard Parts Corp. of this city has purchased the factories and business of the Bock Bearing Co., of Toledo. The Standard Parts Corp. owns the Perfection Spring & Standard Welding companies and is negotiating for the purchase of the Western Spring & Axle Co., which has plants in Ohio and Michigan.

Owners of more than 80 per cent of the Bock Bearing Co. consented to the sale of that concern to the Standard Parts Co. at a basis approximately of $151.60 per share. The Bock Co. is capitalized at $1,200,000 common stock and $450,000 preferred. All of the preferred and $1,173,500 of the common stock are outstanding.

The Bock Bearing Co. was organized by W. E. Bock in July, 1913, and manufactures a tapered roller bearing. It is planned to turn out bearings for 350,000 automobiles in the plant this year, and production will be increased from 2000 to 10,000 per day.

Plant Remains in Toledo

The Bock product is one of the foremost automobile bearings and the company's earning power has been large. Under the conditions of the merger the Bock plant will remain in Toledo. No new securities will be issued in connection with the amalgamation.

It is reported that President William E. Bock, of the Toledo company, will remain with the concern. His inventions have been responsible largely for the success of the Bock company and also of the Owens Bottle Machine Co., also of Toledo.

Officials of the Standard Parts Corp.,

(*Continued on page* 447)

Goodrich Earned 12.76% in 1916

Decrease Due to Failure of Advance in Prices To Keep Pace with Costs

NEW YORK, Feb. 27—Increasing materials costs in the tire industry had its potent effect on the earnings of the B. F. Goodrich Co. in 1916. In its consolidated statement of earnings for last year, the company shows that despite increased sales and prices, the cost of production has advanced to such an extent that the increased business is largely offset. Goodrich earned 12.76 per cent for the common in 1916. This compares with 17.17 per cent in 1915.

Net Sales $70,990,782

Net sales totaled $70,990,782 in 1916, as against $55,416,866 the previous year. The total sales, after including $235,461 in other sales, are $71,226,243, as against $55,884,556 in 1915. Operating expenses totaled $60,611,333, leaving a net profit of $10,614,910, compared with $13,058,648 in 1915.

Common dividends totaled $2,400,000. The company cancelled $700,000 in preferred stock and a further amount of $100,000 appropriated for addition to the pension fund. The directors voted to set aside $121,465, representing the reduction of the preferred stock purchased, from cost to par. Subtracting these totals from a balance of $7,657,764 gives a surplus of $4,336,299, and adding the previous surplus of $10,583,589 gives a profit and loss surplus of $14,919,888.

The company has added to its plant account during 1916 extensions and equipment costing $3,519,549. Beyond completing the work under construction, no further important plant extensions are planned at present.

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Herschell-Spillman Officers Re-Elected

NORTH TONAWANDA, N. Y., Feb. 26—All the officers of the Herschell-Spillman Co. were re-elected at the annual stockholders' meeting Feb. 20, as follows: President, T. J. Wilson; vice-president and general manager, Guy White; secretary and treasurer, Edward O. Spillman; assistant secretary, A. M. Hathaway. A 2 per cent quarterly cash dividend, payable March 30, was declared.

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Cairns Resigns from Saxon

DETROIT, Feb. 27—G. V. H. Cairns, sales manager of the Saxon Motor Car Corp., has resigned and will shortly announce a new connection.

CONSOLIDATED STATEMENT OF THE B. F. GOODRICH CO. FOR PAST 4 YEARS

	1916	1915	1914	1913
Net sales	$70,990,782	$55,416,866	$41,764,008	$39,509,347
Other income	235,461	467,690	562,930	491,317
Total income	$71,226,243	$55,884,556	$42,326,938	$40,000,664
Operating and admin. expenses	60,611,333	42,825,908	36,189,642	36,451,234
Net profit	$10,614,910	$13,058,648	$6,137,297	$3,549,429
Depreciation	890,164	734,544	573,616	541,358
Interest on B. P.	155,982	46,546	123,254	239,907
Preferred dividends	1,911,000	1,960,000	2,068,500	2,100,000
Total deduction	2,957,146	2,741,090	2,765,370	2,881,265
Balance	*$7,657,764	$10,317,558	$3,371,927	$668,164
Common dividends	2,400,000	.....	.....	600,000
Preferred stock cancelled	700,000	1,100,000	900,000	.....
Pension fund	100,000	100,000	.....	.....
Treasury stock	†121,465	11,878	.....	168,411
Contingent reserve	.....	1,700,000	.....	.....
Total deduction	3,321,465	2,911,878	900,000	768,417
Surplus	$4,336,299	$7,405,680	$2,471,927	‡$100,253
Previous surplus	10,583,589	3,177,910	705,982	806,235
Profit and loss surplus	$14,919,888	$10,583,590	$3,177,909	$705,982

*Equal to 12.76 per cent on $60,000,000 common stock, compared with 17.17 per cent earned on stock in 1915.
†Reduction of treasury stock, purchased, from cost to par.
‡Deficit.

CONSOLIDATED BALANCE SHEET OF THE B. F. GOODRICH CO., AS OF DEC. 31, 1916

	1916	1915	1914	1913
Assets				
Plant, good-will, etc.	$74,399,883	$71,502,099	$70,772,418	$71,060,802
Invested in other companies	1,192,124	1,213,477	1,207,058	1,197,058
Treasury stock	905,700	775,700	1,244,200	2,058,700
French Company	3,183,743	2,121,140	1,216,256	570,987
Current assets	35,527,460	31,242,023	20,311,557	19,401,460
Deferred charges	427,970	231,793	185,465	222,957
Total	$115,636,880	$107,086,232	$94,936,954	$94,511,957
Liabilities				
Common stock	$60,000,000	$60,000,000	$60,000,000	$60,000,000
Preferred stock	27,300,000	28,000,000	29,100,000	30,000,000
Current liabilities	8,516,991	4,402,642	1,459,044	3,505,974
Cont. reserve	2,000,000	2,000,000	300,000	300,000
Pension receipts	200,000	100,000	.....	.....
Redemption fund	*2,700,000	2,000,000	900,000	.....
Profit and loss surplus	14,919,889	10,583,589	3,177,910	705,983
Total	$115,636,880	$107,086,232	$94,936,954	$94,511,957

*Appropriation from surplus for redemption of preferred stock.

Dyneto Electric Corp. Formed

Company Reorganized and Capitalized at $500,000—Factory on Two Shifts

SYRACUSE, N. Y., Feb. 23—The Dyneto Electric Co., maker of automobile, electric lighting and gasoline motor starting systems, has reorganized under the corporate laws of this state as the Dyneto Electric Corp., with a paid-in capital of $500,000.

The board of directors of the new corporation is: C. L. Amos, president of the Dyneto Electric Corp.; Jacob Amos, vice-president of the Third National Bank; J. A. Bower, president of Hale & Kilburn Co., Philadelphia; C. A. Chase, president of the Syracuse Chilled Plow Co.; A. E. Doman, chief engineer Dyneto Electric Corp.; A. M. Hall, 2d vice-president of the Liberty National Bank, New York; J. A. Mathews, president of the Halcomb Steel Co.; G. A. Timmons, capitalist; and W. W. Wiard, vice-president Syracuse Chilled Plow Co.

The Dyneto company has been forced to move five times, each time into larger quarters, since its inception in 1896. The present plant is working in two shifts. There are no war orders.

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Arthur Mechanical Engineer for Simms

DETROIT, Feb. 26—Paul Arthur has joined the Simms Magneto in the position of mechanical engineer.

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Cope Engineer for Bantam Bearing

DETROIT, Feb. 24—H. T. Cope, former secretary and treasurer of the Trio Mfg. Co., Detroit, has joined the Bantam Ball Bearing Co. as machanical and sales engineer. Mr. Cope was with the Trio Co. until that concern was sold to the National Machine Products Co.

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Holmes Completing Organization

CANTON, OHIO, Feb. 22—Arthur Holmes, formerly vice-president and chief engineer of the H. H. Franklin Mfg. Co.; Charles Rockwell, former sales manager of the Franklin company, with George Belden and C. G. Herbruck, are the incorporators of the Holmes Automobile Co., with a $2,500,000 capitalization. As was stated in a recent issue of THE AUTOMOBILE, the company will make air-cooled engine automobiles, and will erect a plant in this city.

The incorporators will complete the organization of the company and the sale of stock, $800,000 of which has already been subscribed for. The capitalization will be divided into $1,000,000 common and the rest preferred.

Fisk Co. Raises Tire Prices

Other Makers Expected To Follow Suit Due to Materials and Labor Cost

NEW YORK, Feb. 28—Interests in the tire and automobile manufacturing circles were stirred up to-day on account of a threatened rise in tire prices. The city's telegraph offices have been busy delivering messages from the automobile makers who have made inquiries in regard to the long threatened advance. So far Fisk is the only one which has announced an increase in its list, the advance being 10 per cent. However, now that this company has taken the initiative, it is expected that other tire makers will follow suit. Factory reports indicate a tire shortage in many places.

In fact, it is certain that a few of the big companies will announce increases in the near future. It is stated that one of the largest tire companies now has on the press a new price list which will become effective soon.

Another concern has notified its salesmen not to take orders after April 1, when it is expected that prices will be advanced.

The increase has been pending for over a month, but has been held up on account of lack of decision of any one of the companies to declare a further upward listing from that of Jan. 1, when most of the companies made increases from 10 to 15 per cent.

It has required an abundance of self-restraint for the rubber companies to leave their price tags undisturbed during the past few weeks on account of the high price of rubber and materials.

Laboring conditions in the tire industry have been favorable. Few strikes have occurred. The usual increases in wages have occurred. Rubber prices have been high, though, as have cotton and other materials. The recent submarine warfare policy of the Germans had a potent effect on shipments from the Far East and thus caused a shortage. Supplies of rubber, however, have been coming through Seattle, though not offsetting the shortage through London.

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Tulsa Models in Indianapolis

INDIANAPOLIS, IND., Feb. 24—W. A. King, production manager of the Tulsa Automobile Corp. of Tulsa, Okla., will build his model cars in Indianapolis.

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Bumper Makers Protect Customers

NEW YORK, Feb. 27—Following closely the cross-licensing plan of the National Automobile Chamber of Commerce whereby members exchange rights under their patents, ten makers of automobile bumpers will join to protect their customers. Over twenty patents are concerned in the settlement that has been reached. The action centers chiefly around the Discher patents, owned by G. F. Discher, president of the Gemco Mfg. Co., Milwaukee, which has been active in many suits against other makers of bumpers that have infringed. Now these and other active patents are recognized. The ten companies are the Gemco Mfg. Co., American Brass Foundry Co., Central Brass & Fixture Co., Milwaukee Auto Engine & Supply Co., L. P. Halladay Co., Emil Grossman Mfg. Corp., Auto Parts Mfg. Co., Cox Brass Mfg. Co., Au-To Compressor Co, and the J. H. Sager Co.

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Du Pont Adds to Fabrikoid Business—Buys Marokene Co.

NEW YORK, Feb. 27—The Du Pont Fabrikoid Co., with main offices at Wilmington, Del., has purchased the Marokene Co., Elizabeth, N. J. The Marokene Co. manufactures a material similar to fabrikoid, which is used extensively by the automobile, carriage and upholstery industries.

R. B. Heyward, who has been assistant superintendent of the Fabrikoid company's Newburgh plant, will become superintendent of the Marokene plant.

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Smith Heads Stewart-Warner Corp.

CHICAGO, ILL., Feb. 27—C. B. Smith has been elected president and general manager of the Stewart-Warner Speedometer Corp. W. J. Zucker is secretary and T. T. Sullivan treasurer. L. H. LaChance heads the board of directors. V. R. Bucklin is first vice-president, W. J. Zucker second vice-president, and T. T. Sullivan third vice-president.

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Bill Resigns from Springfield Body

DETROIT, Feb. 27—Harry L. Bill has resigned his position as vice-president and general manager of the Springfield Body Corp., Detroit and Springfield, Mass. Continuous illness and a death in Mr. Bill's family caused his action.

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McKay Is Empire Tire V.-P.

TRENTON, N. J., Feb. 27—E. B. McKay has been elected first vice-president, sales manager and a director of the Empire Tire & Rubber Co. He was formerly manager of the Chicago branch of the company.

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Gloetzner Heads Covert Gear Departments

DETROIT, Feb. 27—A. A. Gloetzner will be in charge of the sales, engineering, and service departments of the Covert Gear Co. when that concern moves here from Lockport, N. Y., Mar. 1. He was formerly sales manager of the company.

Perlman Charges Infringement

Corporation Owning Demountable Rim Patent Brings Suit Against Firestone

NEW YORK, Feb. 27—The Perlman Rim Corp. has brought suit against the Firestone Tire & Rubber Co., charging infringement of the Perlman demountable rim patent, No. 1,052,270. The complainant asks for a perpetual injunction and also for a preliminary injunction pending the determination of the suit. The Perlman patent achieved its chief prominence about a year ago when the United States Circuit Court of Appeals in this city declared the patent valid and infringed by the Standard Welding Co. Since the decision of a year ago L. H. Perlman, the inventor, has had formed the Perlman Rim Corp., capitalized at $10,000,000, which is a subsidiary of the United Motors Corp.

The claims of the patent involved in the suit, 11, 12 and 13, read as follows:

"11. The combination, with a wheel body, of a demountable rim therefor, a locking element, having a tapering portion that is adapted to be moved radially and to thereby exert pressure against the rim outwardly radially of the wheel body, and to act as a wedge laterally, said locking element having an engagement with the wheel body whereby it may be moved radially of the wheel body."

"12. The combination with a wheel and its felly of a demountable rim therefor, a locking element having a tapering end that is adapted to be moved radially and to thereby act as a wedge laterally and exert pressure against said rim radially of the wheel, said locking element having a threaded engagement with the wheel structure whereby it may be moved radially of the wheel."

"13. The combination with a wheel body, of a demountable rim therefor, and a locking element, having a tapering portion, that is adapted to be moved to exert pressure against the rim outwardly radially of the wheel body, said locking element having an engagement with the wheel body."

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Roamer Plant for Kalamazoo

STREATOR, ILL., Feb. 27—The Barley Motor Co., which makes the Roamer car, will shortly remove its organization and plant to Kalamazoo, where factory quarters, aggregating 83,000 sq. ft. of floor-space, have been obtained. The new plant is part of the old Michigan Buggy plant.

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Weymouth Joins Torbensen Axle

CLEVELAND, Feb. 24—H. G. Weymouth, formerly general superintendent of the National Equipment Co., of Springfield, Mass., has just been appointed general superintendent of the Torbensen Axle Co., of this city.

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Rice Joins Cyclemotor

ROCHESTER, N. Y., Feb. 23—A. C. Rice, plant sales manager of the Eclipse Machine Co., Elmira, N. Y., has resigned and is to become general sales manager of the Cyclemotor Corp.

Shipping Conditions Better

Congestion of Freight Relieved —Find Little Difficulty in Sending Out Cars

DETROIT, Feb. 26—The congestion of freight cars is somewhat relieved as compared with conditions a week ago. Some shippers attribute this to the milder weather, others to the new order whereby freight cars must be reloaded to or toward the owning roads, which went into effect last week. A few of the traffic managers believe that the new rule will work harm but the majority are hopeful for good results.

Statements to the effect that all of the automobile makers are driving cars to dealers and distributors have somewhat been exaggerated, and other reports that the companies were seeking drivers to assist them to drive cars overland are likewise untrue.

The Ford Motor Co. has had little difficulty in getting freight cars and is able to make all necessary shipments from Detroit. The company has not found it necessary to resort to overland driving.

The Paige-Detroit Motor Car Co. finds the freight car situation considerably improved and is getting all of its production under way with little difficulty. The company has been driving less than fifteen cars per week overland.

The Studebaker Corp. believes that the freight conditions have passed their highest point of congestion. The company is not doing much overland driving and up to this time has not been forced to tie up or hinder its production.

The Cadillac Motor Car Co. states that the situation is improved and believes that it will probably clear up from now on. The company has been driving about 50 cars per day overland to points within a radius of Rochester, Pittsburgh and Cincinnati.

The Maxwell Motor Car Co., Inc., has secured sufficient freight cars to enable it to make all shipments by rail, and has found it unnecessary to resort to overland driving. The company is getting all of the empties it needs, here in Detroit, and makes shipments from here promptly.

The Hudson Motor Car Co. has shipped 436 cars overland within the past three weeks, but now believes that conditions will allow it to lower this number.

The Packard Motor Co. has approximately $1,000,000 worth of cars on hand which it is unable to ship by rail. The company has cut down its production because of the situation and is driving as many cars as possible overland.

The Hupp Motor Car Co. is driving a few cars overland and is securing enough freight cars to handle the balance of its production, which has been somewhat reduced by the freight car shortage.

The Chalmers Motor Co. has found it necessary to reduce production and to drive about sixty cars per day to Chicago, from which point the cars are loaded on freight cars and shipped to their destination.

Dodge Brothers state that the situation is considerably improved and that more cars are being moved to and from the factory every day. The company drove 500 cars overland in one day two weeks ago and now drives about seventy-five cars per day. Dodge Bros. have rented space in the States Motor Co. plant, Kalamazoo, Mich., and stored there 2000 cars. It is easier to ship cars from that city than from Detroit.

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$9,000,000 More Capital for Goodyear

DETROIT, Feb. 28—*Special Telegram*—The Goodyear Tire & Rubber Co. has issued $6,000,000 new preferred and $3,370,000 new common stock, which will be used for general expansion. This gives a total outstanding stock issue of $23,500,000 preferred and $20,870,000 common. The new preferred stock has been sold to a syndicate of bankers. The new common will be sold to present holders of common stock at par.

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New Detroit Railroad Will Relieve Congestion

DETROIT, Feb. 28—The Pennsylvania Detroit Railroad Co., capitalized at $5,000,000, was formed yesterday as a subsidiary of the Pennsylvania Railroad. It will build a road for the main line to Detroit with a belt line around the city and will eliminate future freight car congestion when completed.

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McGraw-Hill Publishing Co. Formed By Merger

NEW YORK, Feb. 27—Two of New York's large technical and engineering publishing companies have merged under the name of the McGraw-Hill Publishing Co. Under this title are included what was the McGraw Publishing Co. and the Hill Publishing Co. The McGraw company published Electrical World, Engineering Record, Electrical Railway Journal, Electrical Merchandising, Metallurgical & Chemical Engineering and Contractor. The Hill company published American Machinist, Power, Engineering News, Engineering & Mining Journal and Coal Age. J. H. McGraw is the president of the new organization, and A. J. Baldwin, of the Hill company, first vice-president. E. H. Mehrens, of the McGraw organization, is general manager.

N. Y. Gasoline Price Up 1 Cent

Reaches Record High of Last Summer—30-Cent Gasoline Is Predicted

NEW YORK, Feb. 28—Gasoline prices in this city have again reached the high record of last summer. The Standard Oil Co. will to-morrow raise its price 1 cent to garages, from 23 to 24. Consumers are now paying 27 to 28 cents a gallon. Advances of from 1 to 4 cents a gallon have been made throughout the country in the last few months. As a result prices are higher for this time of the year than ever before known. Further advances as the active automobile season approaches are considered inevitable, and 30-cent gasoline is predicted.

Approximately 1,750,000,000 gal. a year are used by automobiles and motor boat and tractor consumption pushes the total up to approximately 2,000,000,000 gal. In addition there is the export trade in gasoline, which is of enormous proportions. So urgent is the demand for fuel for war purposes that Great Britain is drawing heavily on all stocks in this country.

The following table shows the current price of gasoline, tank wagon basis, in principal cities of the country:

	Current Price	Recent Low	Advance
Atlanta, Ga.	26	23	3
Baltimore, Md.	22	20	2
Birmingham, Ala.	26	23	3
Boston, Mass.	24	23	1
Charleston, S. C.	25.5	23.5	2
Cheyenne, Wyo.	23	22	1
Chicago, Ill.	19	16.5	2.5
Cincinnati, O.	22	21	1
Dallas, Tex.	22	20	2
Denver, Col.	23	22	1
Douglas, Ariz.	25.5	24.5	1
El Paso, Tex.	22	20	2
Hartford, Conn.	23	23	..
Houston, Tex.	22	20	2
Kansas City, Mo.	18.9	15.8	3.1
Meridian, Miss.	24	20	4
Minneapolis, Minn.	20	17.5	2.5
New York City	23	21	2
Newark, N. J.	22	20	2
New Orleans, La.	22.5	18.5	4
Norfolk, Va.	22.5	20.5	2
Oklahoma City, Okla.	23	19	4
Pensacola, Fla.	24	20	4
Philadelphia, Pa.	23	21	2
Pittsburgh, Pa.	23	21	2
Pueblo, Col.	23	22	1
Raleigh, N. C.	23.5	21.5	2
Richmond, Va.	22.5	20.5	2
St. Louis, Mo.	18.4	15.9	2.5
St. Paul, Minn.	20	17.5	2.5
San Antonio, Tex.	22	20	2
Santa Fe, N. M.	25	24.5	.5
Savannah, Ga.	25	21	4
Shreveport, La.	23	19.5	3.5
Wilmington, Del.	23	20	3

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Hopkins Leaves Atwood Aeronautic Co.

WILLIAMSPORT, Pa., Feb. 23—N. F. Hopkins has resigned as general manager of the Atwood Aeronautic Co.

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Complete Harroun Production Personnel

DETROIT, Feb. 24—The Harroun Motors Corp. has completed its production department and has appointed B. L. Whitted superintendent of the opera-

tion; C. E. Hoyt, superintendent of machining; N. W. Eagles, superintendent of the body department; E. J. Menke, superintendent of assembly; C. F. Judisch, inspection superintendent; C. F. de Age, chief tool designer; N. A. Nelson, foreman of the tool room; J. F. Collins, factory office manager. Many of these men were formerly associated with H. O. Bernhardt, factory manager, when he was factory manager for the Pierce-Arrow company.

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Belmont Six at $1,750

TOLEDO, Feb. 26—The Belmont Motor Car Co., this city, expects to have its car in production in 60 days. The two final experimental jobs are running over the roads in the South at the present time and matters are being cleared away preliminary to a campaign for dealers and a final selection of all the component parts in the car.

The price has not yet been determined, but it is expected that it will sell for $1,750. It has a Buda six-cylinder engine and some of the leading specifications are: Bore and stroke, 3½ by 5¼ in.; multiple-disk clutch, unit power-plant, Hotchkiss drive, three-quarter floating axle, 33 by 4 cord tires, wire wheels and a 122-in. wheelbase.

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Durable Motor Truck Co. Formed

SOUTH BEND, Ind., Feb. 26—The Durable Motor Truck Co. has been organized at Hammond, Ind., with a capital stock of $500,000. A factory building has been purchased and the concern will commence operations at once in the manufacture of small trucks. The officers of the new company are: Joseph Studer, of Whiting, president; Charles A. Foss, of West Hammond, treasurer, and C. Brown, secretary.

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Noble Motor Truck Co. Formed

SOUTH BEND, Ind., Feb. 27—The Noble Motor Truck Co. has just been organized at Kendallville, Ind. The capital stock is $30,000. The company will manufacture a standardized motor truck having a capacity of 2 tons. The manufacture of smaller and larger trucks will also be the aim of the new company. C. J. Munton is president, H. L. Postel, vice-president; G. M. Patterson, secretary, and H. W. Bradtmiller, treasurer.

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Will Make Hanson Flier

DETROIT, Feb. 24—G. W. Hanson, of the Hanson Motor Co., Atlanta, Ga., the company which will manufacture the Hanson Flier, is now in Detroit working with Don Ferguson, consulting engineer of the company, who is completing the first model at the Puritan Machine Co. plant.

Five New Federal Models

1 to 5 Tons—Four-Speed Gearboxes on Four Models—Steel Wheels on 5-Tonner

DETROIT, Feb. 26—Five new Federal truck models have just been put on the market and will be exhibited at the Boston show for the first time. The capacities range from 1 to 5 tons, and two of these are new for the Federal Motor Truck Co. These are the 1 and 5-ton models. The others are new models also, but are refinements of the previous designs. They have capacities of 1½, 2, and 3½ tons. These five models are taken care of by three different motor sizes: one for the 1-ton, one for the 1½ and 2-ton, and the other for the 3½ and 5-ton. The motors are Federal designs and are similar throughout, as are the chassis of all five truck models in all important particulars. There are a few differences, however, which are necessitated by the difference in capacities. The most notable difference is that the trucks all have four-speed gearboxes except the 1-ton truck, which has three speeds. The 5-ton model is equipped with steel wheels with hollow spokes, whereas the smaller models are fitted with artillery wood wheels.

The prices of the chassis are as follows: 1-ton, $1,650; 1½-ton, $2,100; 2-ton, $2,300; 3½-ton, $3,000; 5-ton, $4,000.

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New ¾-Ton Denmo Truck

CLEVELAND, Feb. 26—A new model ¾-ton Denmo truck will soon be placed on the market by the Denneen Motor Co. The company is arranging to take over a tract of 19 acres of land on which the new Denneen factory will be built. The factory was 194 trucks behind its orders to-day and it was necessary to have the new facilities at once or the company would never catch up with the orders.

D. M. Dickinson has been appointed manager of local sales and service for the Denneen company. He was formerly with the Woolworth Truck Co. and the Champion Motors Co.

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Guaranty Securities Re-elects Officers

NEW YORK, Feb. 26—At the annual meeting of the Guaranty Securities Corp. the following officers and directors were elected: President, George C. Van Tuyl, Jr.; second vice-president and treasurer, E. S. Maddock; secretary, J. Alexander; assistant secretary and assistant treasurer, F. A. Franklin; assistant treasurer, W. J. Bold. Directors: J. D. Dort, Dort Motor Car Co., Flint; Paul Fitzpatrick, assistant general manager of the corporation, New York; Robert Gray, Gray-Dort Motors, Ltd., Chatham, Ont.; C. P. Howland, Murray, Prentice & Howland, New York; R. D. McLennan, Marsh & McLennan, New York; T. G. Meacham, New Process Gear Corp., Syracuse; Stanley Roberts, Roberts-Toledo Auto Co., Toledo; E. F. Rorebeck, Metropolitan Trust Company, New York; Alfred P. Sloan, Jr., United Motors Corp., Detroit; John N. Willys, Willys-Overland Co., Toledo, and Messrs. Van Tuyl, Alexander and Maddock.

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Doble Steam Car Price $2,500

DETROIT, Feb. 27—Both the touring and the roadster models of the Doble steam car will sell for $2,500. Production plans are so nearly completed now that the price can be determined.

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Oneida Motor Truck Co. Organized

GREEN BAY, WIS., Feb. 27—The Oneida Motor Truck Co. has been organized here with $300,000 capital to manufacture a new truck in 1, 1½, 2 and 3½-ton sizes. The concern is backed by local business men and contemplate large production eventually. Factory facilities have already been provided. L. P. Fortin, formerly sales and advertising manager of the Menominee Motor Truck Co., is director of sales and advertising, and G. A. Lindstrom, formerly superintendent of the Menominee concern, is factory superintendent. His pneumatic radiator shock absorber will be incorporated in the trucks to be built.

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Fenton Succeeds Jones, of Empire

INDIANAPOLIS, Feb. 22—H. W. Fenton has become advertising manager of the Empire Automobile Co. He was formerly connected with the Remy Electric Co., Anderson, Ind., and the Nordyke & Marmon Co., this city, in the sales and advertising departments. He succeeds T. O. Jones, who resigned last week.

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Kriedler and Spice with Detroit Lubricator

DETROIT, Feb. 24—H. W. Kriedler has been appointed chief engineer and C. G. Spice experimental engineer of the Detroit Lubricator Co.

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Hatch Goes to Parish & Bingham

CLEVELAND, Feb. 26—Charles Hatch, sales manager of the Perfection Spring division of the Standard Parts Corp., will become sales manager of the Parish & Bingham Co. March 1. William Culver, traveling representative of the Perfection Spring division, will be made sales manager of the division.

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Starke Resigns from Maxwell

DETROIT, Feb. 24—George Starke has resigned from the Maxwell Motor Co. as director of publicity, and has joined the Campbell-Ewald Co. in a like capacity.

M. & A. M. To Extend Benefits

Grouping of Various Accessories Makers May Concencentrate Activities

NEW YORK, Feb. 27—An extensive elaboration of its credit department, the strengthening of other departments now in operation and the addition of varied benefits, are matters which are up for discussion by the executive committee of the Motor and Accessory Manufacturers' association. The finance committee has already started preliminary work for the extension of the credit department service.

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Grouping of Makers

Another meeting will be held in 2 weeks at which the association will take up many points of interest and of much benefit to the members. For instance, there will be a discussion about grouping the different parts and accessory makers. Each group would take in only one product, such as motors. The object would be to meet, say, twice a month, at which meeting all troubles and points of interest would be discussed. Each group would have its own set of officers and with some convenient city picked for the meeting. Of course the groups would be directly under the supervision of the Motor and Accessory Manufacturers. Thus this system would be following out that employed by the Standards Committee of the Society of Automobile Engineers, by which standards for the various classifications of parts are placed in the hands of divisions that concentrate on the one subject.

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Uncertainty in Washington—Revenue and P. O. Bills Held Up

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The postoffice appropriation bill, which has passed both houses of Congress with the exception of three or four amendments, neither one of which affects the fundamentals of the measure, is in danger of being defeated because of the failure of conferees to agree upon the pneumatic tube provision. This provision, in which the automobile industry is interested because of the proposal of the postoffice department to substitute additional motor trucks in numerous large cities in lieu of pneumatic tubes, has passed the House, but it was amended in the Senate. The Senate went on record in favor of retaining the tubes, appointing a commission to investigate them, and recommending to Congress whether the Government should or should not buy them.

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Britain Wants 2000 Tractors

Power Plows Needed to Increase Food Output—Mississippi Valley an Example

NEW YORK, March 1—Cable dispatches from London stating that the British Isles wants 2000 farm tractors, which are to be used for night plowing in order that food production of the Isles will be increased, offer a good possibility for the development of export trade. In the medium weight tractor the output of machines last year was not equal to the demand and the question arises if our manufacturers will be able to take care of this trade. There is also the consideration of shipping facilities.

Great Britain is discovering that the adoption of farm tractors means more than the mere substitution of motor power for horsepower. The tractor in England will not only make up for the shortage of horses, but it will also permit of plowing 24 hr. in the day, which is a big consideration in agriculture. It has been demonstrated in the Mississippi Valley that tractor plowing in the month of July results in much greater soil fertility that plowing in August and September. The July plowing retains a larger percentage of nitrate in the soil than plowing in other months. With the tractor production last year of 40,000 and a contemplated production this year of 70,000, we hope our makers will be able to care for this extra business.

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Lyons Atlas To Build Tractors

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Wisconsin Motor Enlarges

Increases Capital to $1,000,000 —Output To Be from 50 to 75 Per Cent Larger

MILWAUKEE, WIS., Feb. 27—The Wisconsin Motor Mfg. Co., Milwaukee, Wis., has increased its capital stock from $350,000 to $1,000,000 and started work on plans for the enlargement of its works at Forty-seventh Avenue and Burnham Street, which will make possible an increase of from 50 to 75 per cent in its output.

The increased capital is the result of the declaration of a stock dividend of 100 per cent, in addition to the regular cash dividends, at the annual meeting of the company. The issue of $1,000,000 is divided between $700,000 common and $300,000 in 7 per cent preferred stock.

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Timken-Detroit Bonus System

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Generator Uses Exhaust Gases to Superheat All Fuel Oils

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sales for January, 1917, totaled over 100 per cent more than the sales for January, 1916. The company is erecting several buildings. An extra dividend of 10 per cent was declared in addition to the regular annual dividend of 7 per cent.

Directors elected were: J. G. Rumney, R. S. Drummond, W. S. Russel, H. Russel, L. M. Butzel and M. P. Rumney of Detroit, and C. H. O. Meyer of Clinton, Iowa.

Officers elected were: J. G. Rumney, president; R. S. Drummond, vice-president; H. F. Wardwell, secretary and E. R. Ailes, treasurer.

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Mansfield Tire Increases Capital

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Globe Tire To Expand—Linerd Joins Company

NEW YORK, Feb. 26—The Globe Tire Mfg. Co. has recently made certain financial alterations in its policy and shortly will enter the tire industry in an aggressive manner. Present production facilities are 1000 tires a day, all of these being hand made and guaranteed for 6000 miles. The plant is located at Trenton, N. J., and the company has acquired 12 acres of land adjoining the factory for expansion. Joseph B. Linerd has been appointed general manager and a member of the board of directors. Mr. Linerd was previously with Goodyear and Ajax.

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Pennsylvania Rubber Holds Election

JEANNETTE, PA., Feb. 23—The Pennsylvania Rubber Co. elected the following directors and officers at the annual meeting last week: Directors—Herbert DuPuy, H. W. DuPuy, C. M. DuPuy, S. G. Lewis, G. W. Shiveley, G. A. McLaughlin. Officers — Herbert DuPuy, chairman; H. W. DuPuy, president-treasurer; C. M. DuPuy, vice-president; S. C. Lewis, general manager; G. W. Shiveley, secretary, and C. G. Morrill, assistant treasurer.

Steel Prices Are Higher

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Bessemer and Open Hearth Rise to $70 a Ton—Rubber Drops in Slow Market

NEW YORK, Feb. 27—The rise of Bessemer and open-hearth steel to $70 per ton featured last week's market activities. Most of the prices held constant and active, particularly in the metals. Rubber prices, on account of small number of rubber-laden ships being sunk last week, dropped on a slow market. Para yesterday quoted at 80 cents a pound and Ceylon at 85 cents. Tin rose $1 per 100 lb. to $50, and antimony rose to 34 cents, a gain of 3 cents a pound. Lead was steady throughout the week at $11.50 per 100 lb. Yesterday it dropped to $11.

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Expected Timken Earnings $3,098,135

DETROIT, Feb. 27 — Timken-Detroit Axle Co. is expected to find at the next directors meeting that the total earnings for the year 1916 have been $3,098,135. It is also believed that a cash dividend of from 30 to 60 per cent will be declared. This estimate is based on the earnings of $1,198,135.82 during the first 5 months of last year.

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$2,857,328 Profits for National Enameling

CLEVELAND, OHIO, Feb. 24—The National Enameling & Stamping Co. in a preliminary draft for its annual statement for the year ended Dec. 31 last, displays a net profit of $2,857,328, as compared with $1,999,861 in 1915, a net available for common dividends of $2,132,921, or 13.6 per cent, compared with $455,479, or about 3 per cent of previous year.

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National Carbon Earns $4,232,000

NEW YORK, Feb. 24—The National Carbon Co. earned $4,232,000 for the common stock in 1916, compared with $2,158,000 in 1915, according to the annual report. After paying $392,000 in preferred and $996,550 in common dividends, $3,211,005 was added to the surplus account.

All factories were operated to full capacity during the year except when the output was limited by scarcity of labor. Large additions are being made to some of its plants and there is under construction a new plant in San Francisco.

—

Receiver Asked for Pennsy Motors

PHILADELPHIA, Feb. 27—A receiver has been asked for the Pennsy Motors Co. The petition alleges the company is mismanaged and the stock is oversubscribed.

—

Receiver for Alliance Rubber

ALLIANCE, OHIO, Feb. 26—Attorney H. C. Koehler has been appointed receiver for the Alliance Rubber Co. and the Alliance Tire & Rubber Co. The work of the receiver will be a task, as there are two distinct companies and yet one. The first company was organized in March, 1913, with a capital of $58,000. This was the Alliance Rubber Co. In 1916, through the efforts of some of the members of the company, a reincorporation under the laws of Delaware was effected and the capital increased to $2,500,000 and the name changed to that of the Alliance Tire & Rubber Co.

—

Receiver for Double Service Tire

AKRON, Feb. 24—A receiver has been asked for the Double Service Tire & Rubber Co., of Akron. Petition to this effect was filed in Common Pleas Court here this week. The court petition asks that the equipment and buildings be sold.

—

No Bid for Findlay Tire Co.

FINDLAY, OHIO, Feb. 24—There were no bidders for the Toledo-Findlay Tire & Rubber Co. last week when it was offered for sale by the receiver. The appraised value is $30,500.

—

Continental to Retire Notes

NEW YORK, Feb. 28—The Continental Motors Co. on April 1 will retire all the outstanding coupon notes amounting to $1,000,000 at the Liberty National Bank. The notes would mature automatically $200,000 annually from April 1, 1917, to April 1, 1917. A bonus of 1 per cent will be allowed on those maturing from 1918 to 1921.

—

50 Per Cent Dividend by Prudden

LANSING, MICH., Feb. 27—The postponed meeting of W. K. Prudden & Co. stockholders was held in this city today, declaring a 50 per cent stock dividend. The concern's financial report is

Daily Market Reports for the Past Week

Material	Tues.	Wed.	Fri.	Sat.	Mon.	Week's Changes
Aluminum, lb.	.57½	.57½	.57½	.57½	.57½	...
Antimony, lb.	.31	.31	.34	.34	.34	+ .03
Bessemer Steel, ton	65.00	70.00	70.00	70.00	70.00	+5.00
Copper, Elec., lb.	.37	.37	.37	.37	.37	...
Copper, Lake, lb.	.37	.37	.37	.37	.37	...
Cottonseed Oil, bbl.	12.42	12.42	12.40	12.50	12.69	+ .27
Fish Oil, Menhaden, Brown, gal	.74	.74	.74	.74	.74	...
Gasoline, Auto, bbl	.23	.23	.23	.23	.23	...
Lard Oil, prime, gal	1.36	1.36	1.36	1.36	1.36	...
Lead, 100 lb.	11.50	11.50	11.50	11.50	11.00	— .50
Linseed Oil, gal	.94	.94	.94	.94	.94	...
Open-Hearth Steel, ton	65.00	70.00	70.00	70.00	70.00	+5.00
Petroleum, bbl., Kans., crude	1.70	1.70	1.70	1.70	1.70	...
Petroleum, bbl., Pa., crude	3.05	3.05	3.05	3.05	3.05	...
Rapeseed Oil, refined, gal	1.05	1.05	1.05	1.05	1.05	...
Rubber, Fine Up-River, Para, lb	.83	.83	.83	.82½	.80	— .03
Rubber, Ceylon, First Latex, lb	.89	.89½	.89½	.86	.85	— .04
Sulphuric Acid, 60 Baume	1.00	1.00	1.00	1.00	1.00	...
Tin, 100 lb.	49.00	49.25	49.50	49.50	50.00	+1.00
Tire Scrap, lb.	.06½	.06½	.06½	.06½	.06½	...

said to show earnings equal to 85 per cent on the common.

The Prudden company has also increased its capital stock from $1,000,000 to $2,000,000.

—

Fisher Asks N. Y. Exchange Listing

NEW YORK, Feb. 22—Application has been made to the New York Stock Exchange for the listing of $5,000,000 of 7 per cent preferred and 200,000 shares of common stock of the Fisher Body Corp., of Detroit.

—

Dividends Declared

Hall Lamp Co., monthly dividend of 2 per cent payable Feb. 24 to stock of record Feb. 20.

Pennsylvania Rubber Co., quarterly of 1½ per cent on common and 1¾ per cent on preferred, payable March 31 to stock of record March 15.

Fisk Rubber Co., quarterly of 1¾ per cent on second preferred, payable March 15 to stock of record Jan. 31.

Ajax Rubber Co., quarterly of $1.25, payable March 15 to stock of record Feb. 28.

National Screw and Tack Co. 1½ per cent, payable March 1, to stock of record Feb. 19.

Packard Motor Car Co., quarterly of 1¾ per cent on preferred, payable March 15 to stock of record Feb. 28.

—

Heartz Resigns from Premier

INDIANAPOLIS, Feb. 27—Roy D. Heartz, assistant sales manager of the Premier Motor Corp., has resigned his position.

Motor Issues Are Steady

—

Issues Hold Strong with Substantial Gains—Detroit Issues Weak

NEW YORK, Feb. 28.—Steadiness marked last week's automobile and accessory securities prices, despite the indecision of the buying public and a collapse in the buying movement. Up to yesterday, motor issues were in demand and were quoted higher. United Motors, Maxwell, Chevrolet, General Motors, and the tire issues were higher and the general feeling was that the motor issues were due for a bullish movement. Yesterday the announcement that the sinking of the Laconia was considered an overt act caused the listing of stocks downward. Motor issues, though lower, were not affected seriously.

—

Michigan Securities Commission Questions Continental Asset Valuations

LANSING, MICH., Feb. 24—The Michigan securities commission has issued an order which forbids the Continental Motors Corp. from paying more than 6 per cent on its common stock until the $10,265,000 representing, according to the company's attorney, the value of patents, trade marks, goodwill, etc., is reduced to $5,000,000. The commission does not for the present interfere with sales on the stock exchange.

The Continental Motors Corp. has asked the Michigan securities commission for a rehearing on the ground that not all facts were previously presented. The company will present new data not before available at the rehearing, Feb. 28, and expects that the commission's verdict will be favorable in the light of the added evidence.

—

S. R. B. and Rockwell-Drake Plants Sold to Marlin Arms

NEW YORK, Feb. 28—The Standard Roller Bearing Co. plant in Philadelphia, and the Rockwell-Drake plant in Plainfield, Conn., were sold to-day to the Marlin Arms Corp. Both these companies made ball bearings, the Philadelphia concern also making roller bearings. Two days ago the sale of the Standard Roller Bearing Co. assets to Frank Smith, representing a syndicate of bankers, was confirmed by Judge Thompson in the United States District Court, Philadelphia.

The Standard Roller Bearing Co. went into the receivers' hands in October, 1913. A creditors' supervising committee of five was selected with the provision that the committee would have the power at any time to liquidate the concern should such course seem desirable. Several efforts were made to reorganize the company but failed.

The company was organized in 1901 and in 1906 paid a dividend of 37 per cent. It employed approximately 1000 men.

Automobile Securities Quotations on the New York and Detroit Exchanges

	Bid	Asked	Net Ch'ge
*Ajax Rubber Co.	69½	72	+ ½
*J. I. Case T. M. Co. pfd	82	85	..
Chalmers Motor Co. com	20	30	—5
Chalmers Motor Co. pfd	..	..	..
*Chandler Motor Car Co	97½	98	+1½
Chevrolet Motor Co	108	115	+6
Fisher Body Corp. com	35	40	..
Fisher Body Corp. pfd	90	95	—20
Fisk Rubber Co. com	75	85	..
Fisk Rubber Co. 1st pfd	101	105	..
Fisk Rubber Co. 2d pfd	70	100	—15
Firestone Tire & Rubber Co. com	144½	147½	+8½
Firestone Tire & Rubber Co. pfd	107	109	..
*General Motors Co. com	113⅝	114½	+5⅝
*General Motors Co. pfd	88	89½	— ½
*B. F. Goodrich Co. com	55½	56	—1
*B. F. Goodrich Co. pfd	108	108½	—1
Goodyear Tire & Rubber Co. com	272	276	+18
Goodyear Tire & Rubber Co. pfd	106½	108	..
Grant Motor Car Corp	5	7	..
Hupp Motor Car Corp. com	3½	4½	—2½
Hupp Motor Car Corp. pfd	88	95	..
International Motor Co. com	15	19	..
International Motor Co. 1st pfd	..	70	..
International Motor Co. 2d pfd	..	30	..
*Kelly-Springfield Tire Co. com	54	56	— ¼
*Kelly-Springfield Tire Co. 1st pfd	91	95	+1
*Lee Rubber & Tire Corp	21½	22	+1
*Maxwell Motor Co., Inc., com	55½	56	+ ½
*Maxwell Motor Co., Inc., 1st pfd	68⅛	69	+ ⅛
*Maxwell Motor Co., Inc., 2d pfd	34¾	35½	+ ½
Miller Rubber Co. com	253	257	+3
Miller Rubber Co. pfd	105	106¾	..
Packard Motor Car Co. com	157	165	..
Packard Motor Car Co. pfd	..	102	..
Paige-Detroit Motor Car Co	38¼	39	— ¼
Peerless Truck & Motor Corp	15	18	+1
Portage Rubber Co. com	165	169	+3
Portage Rubber Co. pfd	..	..	..
Regal Motor Car Co. pfd	27	33	..
Reo Motor Car Co	36	37	— ½
*Saxon Motor Car Corp	53¼	55	+1½
Springfield Body Corp. com	70	80	..
Springfield Body Corp. pfd	110	120	..
Standard Motor Construction Co	6½	7½	+ ½
*Stewart-Warner Speed. Corp	83⅞	84⅞	—1⅛
*Studebaker Corp. com	100¾	101½	—3½
*Studebaker Corp. pfd	102	105	—4
Swinehart Tire & Rubber Co	80	85	..
United Motors Corp	41¼	41¾	+ ¼
*U. S. Rubber Co. com	53½	54½	— ¼
*U. S. Rubber Co. pfd	107	109	+1
*White Motor Co	49	50	+ ¼
*Willys-Overland Co. com	34	34⅛	+1½
*Willys-Overland Co. pfd	97	98⅝	— ½

*At close Feb. 27, 1917. Listed New York Stock Exchange.

OFFICIAL QUOTATIONS OF THE DETROIT STOCK EXCHANGE

ACTIVE STOCKS

	Bid	Asked	Net Ch'ge
Auto Body Co	..	34	..
Chalmers Motor Co. com	..	..	..
Chalmers Motor Co. pfd	..	..	..
Continental Motor Co. com	7½	7⅝	—1⅝
Continental Motor Co. pfd	98	99	..
Ford Motor Co. of Canada	245	253	..
General Motors Co. com	..	..	..
General Motors Co. pfd	..	..	..
Maxwell Motor Co. com	53½	56½	..
Maxwell Motor Co. 1st pfd	..	..	..
Maxwell Motor Co. 2d pfd	..	..	..
Packard Motor Car Co. com	158	159½	..
Packard Motor Car Co. pfd	..	101½	..
Paige-Detroit Motor Car Co	38½	38⅞	— ⅜
W. K. Prudden Co	..	50	..
Reo Motor Car Co	36½	37	..
Studebaker Corp. com	99	102	..
Studebaker Corp. pfd	..	..	..
C. M. Hall Lamp Co	..	..	..

INACTIVE STOCKS

Atlas Drop Forge Co	38	..	..
Kelsey Wheel Co	..	..	..
Regal Motor Car Co. pfd	25	30	+2

66,176 Cars for Iowa in 1917

Compared with 52,941 in 1916 —Agriculture Is Basis for Prosperity of State

DES MOINES, IOWA, Feb. 24—Iowa's greatest year for the buying of automobiles was off with a flying start when the eighth annual Des Moines Automobile Show was opened this week. A total of sixty-five cars, including three electrics, were shown, and there were nine accessory exhibits. The first annual Des Moines motor truck show, held on the same dates, helped to draw dealers from every county of the State and swell the attendance to an estimated 40,000, as compared with 32,000 in 1916.

Iowa bought 52,941 automobiles in 1916. At an average price of $800 per car, which is considered a fair average for a State of prosperous farm buyers, the State's 1916 bill for new cars was $41,600,000.

Iowa will buy 25 per cent more cars this year than last, in the opinion of all dealers and nearly all bankers. This will mean a total of 66,176 cars to be bought in the State during the year. Dealers and bankers say that the estimated number will not even supply the farmers of the State who are prospects.

Unparalleled prosperity in Iowa is the basis of the estimates for 1917 business by bankers and dealers. The Des Moines situation is shown by the increase in bank clearings from $281,949,456.94 for 1915 to $332,604,545.86 for 1916 and a proportionately greater increase already registered for 1917 as compared with the first 6 weeks of 1916.

Crops Bring Prosperity

Agriculture is the basis of Iowa prosperity and corn buys the automobiles. Iowa has the money to pay for the 66,000 cars which she is scheduled to buy this year. The coin necessary is only a small part of the wealth derived from the crops of last year. The Iowa Weather and Crop Service gives $597,165,673 as the total value of Iowa farm crops in 1916 as compared with $414,379,000 in 1915. If the State could buy 53,000 cars on the strength of the 1915 crop, is an increase of 25 per cent enough to be expected in face of a $200,000,000 increase in the value of farm crops?

Iowa led all States last year in the production of corn and oats, and in the number and value of horses, hogs, and combined livestock. The yield of corn for the year was 366,825,000 bu. valued at $293,460,000 as compared with a yield in 1915 of 298,500,000 bu. valued at $152,235,000. The increase in value of the corn crop alone, amounting to $141,000,000, would be enough to buy 150,000 automobiles at $800.

With a decrease of 8,000,000 bu. in the wheat yield the farmers still received as much for their 1916 crops as for their crop of 1915. The oats crop brought $26,000,000 more in 1916 than in 1915, with a total yield of 186,000,000 bu.

Iowa ranks second in the United States in the production of hay, in the number and value of beef cattle, in the value of farm buildings and farm property, and in the area of improved land. The State ranks third in the number and value of dairy cattle and of poultry.

The following table shows the wonderful automobile growth of Iowa since 1910:

Year	Number of Cars	Increase Over Previous Year
1911	27,988	.....
1912	44,188	16,190
1913	70,068	25,880
1914	106,087	36,019
1915	145,109	39,022
1916	198,050	52,941

—

Newlin Represents Pierce-Arrow in Texas and Oklahoma

BUFFALO, Feb. 27—William B. Newlin, who has been associated for many years with the Pierce-Arrow Motor Car Co., is leaving that concern on March 1 to represent Pierce-Arrow products as an agent in Texas and Oklahoma.

For a number of years Mr. Newlin represented the Pierce-Arrow company in Europe as service engineer, returning about a year before the war to assume the management of the sales promotion department at the factory. For the past year and a half he has held the position of passenger car sales manager.

Mr. Newlin is entering the concern of Gray and Reardon in the capacity of vice-president and sales manager, a corporation having been formed to handle all of Texas and the greater part of Oklahoma with the title of the Gray, Reardon, Newlin Co., with headquarters at Dallas and branches at all important points in the two States.

—

Thompson Is Stutz Sec.-Treas

INDIANAPOLIS, Feb. 24—In THE AUTOMOBILE for Feb. 15 it was stated that W. N. Thompson had become treasurer and general manager of the Stutz Motor Car Co. This was incorrect as Mr. Thompson is secretary and treasurer, H. C. Stutz being president and general manager. T. L. Marshall, who succeeded Mr. Thompson as sales manager, was formerly connected with the Marion Motor Car Co., instead of with the Stutz organization as stated.

—

Lyons Fair March 18

LYONS, FRANCE, Feb. 18—The opening of the Lyons Fair has been postponed to March 18.

Pa. S. A. E. Studies Preparedness

Steinmetz Advocates Groups of Engineers to Discuss Suggestions for Defense

PHILADELPHIA, Feb. 21—The Automotive in War, the subject of Jos. A. Steinmetz's talk at to-night's meeting of the Pennsylvania Section of the S. A. E., proved not only pertinent, but convincing as regards the lack of co-operation between the government and the citizen in the invention of instruments for defense or offense in war.

Mr. Steinmetz, who is the designer of the Janney, Steinmetz Co., this city, has collected a most complete set of illustrations showing the fighting machines produced by the ingenuity of Europe. He advocated that the engineers of the United States get together in groups to discuss preparedness, that is, the design of trucks, etc., for use in war. He compared the European method of fostering invention and ideas by financial help with that of the United States Government where each individual must see his own ideas and inventions through by means of his own finances. As a result of this lack of co-operation he advocated, as stated, more groups of engineers and individuals, to work on suggestions.

100,000 Armored Cars

There are at the present time about 100,000 armored cars in Europe, many of which were designed by civilians. Many ideas have been worked out successfully by the European governments. For instance, one of the belligerent countries is now working on an aeroplane with invisible planes, the material in the planes being a special preparation containing the strength and rigidity of the canvas now in use, and being transparent. Another suggestion, and by the way, by an American, is the present use of floats on the German dirigibles for use on the water.

Mr. Steinmetz deplored the present apathy on the part of the American people as regards preparedness. More interest should be shown and measures taken to prepare for the future. At the present time the United States has an organized army of 236,000, out of a total of 20,538,347 available. More enlistments should be made and more thought should be given in regard to what would really happen should war be declared.

Is our ambulance corps ready? Have we enough of these for actual warfare? Our armored trucks, what of them? How do our few compare with Europe's 100,000? Our aeroplanes, have they the proper protection from gunfire, can they go on long reconnoitering trips, and are they

fitted with the right guns? These were some of Mr. Steinmetz's queries.

An idea of what the engineers in Europe have accomplished was shown on the lantern slides during Mr. Steinmetz's talk. For instance, all ambulances and motor driven vehicles have wire wheels so as to minimize the damage to spokes from shell fire. The armored trucks and "tanks" have been successful by reason of their complete armor protection and the aeroplanes have played a prominent part. The English have practically solved the dirigible menace in London by means of aerial trawlers, or bombs hanging from the aeroplanes.

—

Four Detroiters Enter Inter-City

DETROIT, Feb. 27—Detroit has four entries for its team in the inter-city competitive automobile tour starting from Buffalo on July 17 and finishing there July 19. Entries are: Jesse G. Vincent, J. Edward Schipper, W. G. Bryant and W. A. Brush.

—

Bradford-Ackerman Represents Makers

NEW YORK, Feb. 22—A. H. Ackerman has resigned from the U. S. Light & Heat Corp. to form the Bradford-Ackerman Corp., this city, representing manufacturers of accessories, etc., for domestic and export trade. Mr. Ackerman was formerly vice-president and general manager of the U. S. L. company, and Mr. Bradford was a former sales manager of the same company. Offices will be maintained in the Forty-second Street Building.

—

Marsaglia, of Targa Florio Fame, Dead

TURIN, ITALY, Feb. 5—Giovanni Marsaglia, automobile engineer and race driver, was killed yesterday while making a trial flight as passenger aboard an Italian army aeroplane. The machine was a new type, carrying a motor for which Marsaglia was partly responsible. On coming to the ground after a height test the machine got out of control and fell a complete wreck.

Mr. Marsaglia had been connected for a number of years with the Aquila-Italiana Company, of Turin, a rather small firm noted for the originality of its designs. He took part in practically all the Italian races and competitions of the last half-dozen years, and was a starter in the French Grand Prix of 1914. In 1913 he finished second in the Targa Florio race round Sicily, being beaten by Nazzaro, but secured first place on the first of the 2 days of that race. When Italy came into the war, Marsaglia joined the Air Corps, and was stationed at Turin, where he was responsible for the tuning up and testing of new machines.

29 New Exhibits at Boston

512 Automobiles and Trucks—170 Accessory Exhibits—$4,000,000 Business?

BOSTON, Feb. 28—Fifteen automobiles and fourteen trucks will be displayed for the first time in Boston at the show in Mechanics Building and Horticultural Hall March 3-10. The total number of cars and trucks to be shown is 512. There will be ninety-one makes of passenger cars, and forty-eight makes of trucks exhibited. There will also be 170 accessory exhibits.

The automobile salon will be held in the Copley-Plaza Hotel March 5-10, from 11 a. m. to 11 p. m. daily.

About 7000 agents, salesmen, and attendants will have an active part in the Boston show; and the management expects 150,000 visitors with an estimated business of $4,000,000.

The "Hall of Jewels" in the grand hall will be an elaborate display of electrical pillars, arches, and illuminated pendants. The exhibition hall will be decorated to represent different countries. Six orchestras have been provided.

The show is under the auspices of the Boston Automobile Dealers' Assn. and the Boston Commercial Motor Car Assn. Chester I. Campbell is manager.

—

Join Regal Staff

DETROIT, Feb. 24—C. Carter, formerly traveling representative in England for the Haynes Automobile Co., has joined the sales force of the Regal Motor Car Co. as a district manager. W. H. Martleman, formerly Regal distributer at Philadelphia, has rejoined the Regal Co. as the district manager at Philadelphia.

—

1¼-Ton Bethlehem Uses G. B. & S. Engine

NEW YORK, Feb. 24—In THE AUTOMOBILE for Feb. 15 it was stated that the 1¼-ton Bethlehem truck is equipped with a Lycoming engine. This was an error as the Golden, Belknap & Swartz engine is used. It was also stated that neither the 1¼-ton nor the 2¼-ton model is fitted with a governor. The Bethlehem Motors Corp. states that Pierce governors are standard equipment.

—

Northwest Racing Circuit Completed

SEATTLE, Feb. 27—The Northwest Auto Racing Circuit is making final arrangements for an attractive spring and summer racing tour which is to open at Walla Walla, Wash., Decoration Day, May 30. The next racing date will be at the Spokane Interstate Fair Grounds, Spokane, Wash., July 4, when the Inland Empire Century, 100 miles, Class D, Free for All will be the feature. Prizes: First, $1,000; second, $400; third, $300; fourth, $200; fifth, $100. The winner will receive $1,000 and the Thaddeus S. Lane Trophy goes to the winning driver.

Other cities and dates of the circuit are Missoula, Mont., July 15; Anaconda, July 22; Great Falls, July 29; Billings, Aug. 5. All racing will be sanctioned by the American Automobile Association, and Robert A. Hiller, manager for the circuit, has temporary offices at 819 24th Avenue, Seattle.

—

Des Moines Speedway Lost to A. A. A.

CHICAGO, Feb. 27—Speedway racing under American Automobile Assn. sanction lost one of its courses to-day, when the Des Moines 1¼-mile track was leased by Friedman Brothers, a concern putting on Hippodrome racing and operating under the auspices of the International Motor Contest Assn. The company has eighteen cars and a number of aeroplanes and has operated considerably in California.

Max Friedman declared they expect to lease other speedways and conduct a series of races on each. He claims Louis Disbrow is one of his drivers.

—

Hupmobile Now "Show to Show" Car

DETROIT, Feb. 24—The Hupmobile capital to capital car which recently completed its 20,000 mile journey around the United States has now commenced another tour, and will go from show to show, visiting one automobile show each week. The car is now at St. Louis and from there will go to Brooklyn and later to Boston.

—

Standard Parts Buys Bock Bearing

(*Continued from page* 437)

of which Mr. Christian Girl is president, has obtained options on 80 per cent of the common stock of the Bock company at $151.60 a share. Mr. Bock's company is capitalized at $1,200,000 common stock, of which $1,175,500 is outstanding and $450,000 preferred stock, all outstanding. Payment for the stock will be made on the basis of one-third cash, one-third in preferred stock of the Standard Parts Corp. at 101½ and one-third in the common stock of the same corporation at 85.

Mr. Bock will become a director of the Standard Parts Corp. under the stipulations of the merger. Other directors will be: H. P. McIntosh, president of the Guardian Savings & Trust Co.; F. F. Prentiss, F. E. Borton and Maynard H. Murch.

—

Riess to Sell Harroun in N. Y.

NEW YORK CITY, Feb. 22—Charles E. Riess & Co. has secured the Metropolitan district for Harroun cars.

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New England's Future

NEW ENGLAND, once the home of the automobile industry, is still one of the most important parts of it, in that from New England come the machines and tools that make the Western factories possible, but New England has still a feeling that she let the automobile business slip through her fingers.

Lately there has been much talk of new car plants for New England, for small outputs of high-grade vehicles chiefly, and still more talk of aviation plants, while the accessory field is being investigated by some of the New England firms whose munition contracts are coming to an end.

New England to-day is crowded with skilled workers, her manufacturers are prosperous and ready to venture somewhat more briskly perhaps, so there seems little doubt that new automobile products are coming. While existing plants in New England are seldom of a character that would permit their conversion into large production automobile factories, they are mostly eminently suited for the making of components of all kinds; from engines and axles to lamps and spark plugs.

There is plenty of demand for more stock components, plenty of demand for high-grade accessories, plenty of demand for such things as wire wheels and universal joints, over and above the capacity of existing producers. This being so, there is a great opportunity for New England to increase her automobile importance, and there is not much doubt but that the chance will not be allowed to slip by.

The Home and the Worker

UP to a year ago large employers of labor regarded the housing problem carelessly. In fact, in many instances they gave it no regard at all. But the past 12 months has witnessed a great change. Practically every manufacturer has had demands made upon his factories that doubled and tripled his organization and which were for a time beyond his capacity. Many cities were forced to import from 10,000 to 30,000 workers within the year.

These men with their families produced congestion and a famine of homes. Every community so situated suffered from the greatly augmented population and a serious condition resulted for manufacturers since it was essential to have labor but impossible to have it unless the workers could find homes. Consequently housing has been an unwelcome but important manufacturing problem.

And it has been a problem that has, in some instances, been wrongly handled. Some employers imagined that the solution was merely a matter of building a number of shacks, a procedure that works harm to the employer and the employee. Men with families and single men refused to live under makeshift conditions, and because of them have added to the usual manufacturing difficulties by increasing the labor turnover, creating discontent in the shops and thus causing defective products and reduced production.

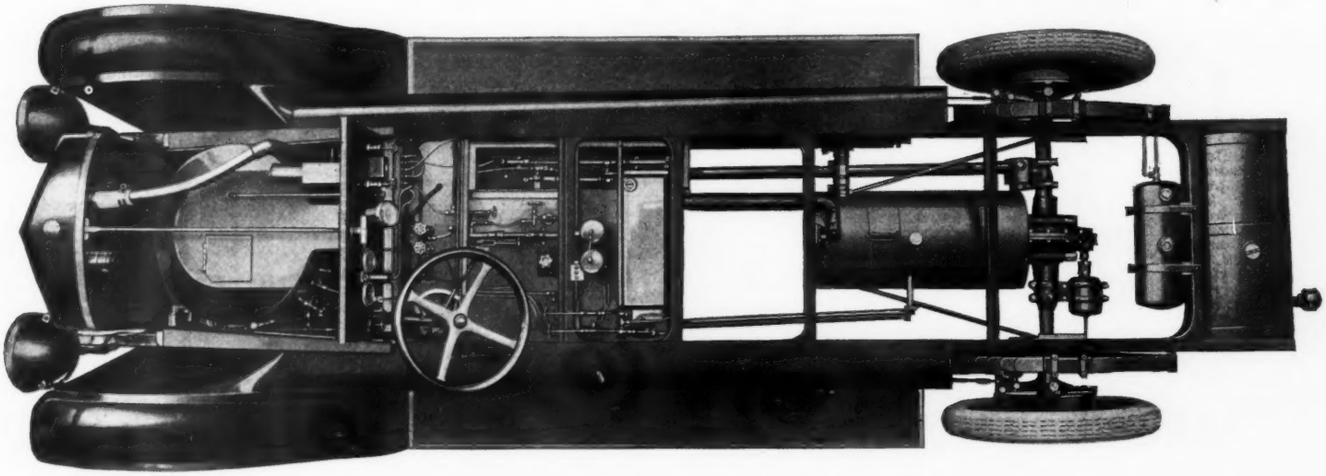
The important question confronting large employers is not the construction of many houses but rather the construction of many homes. Involved in the question are the problems of good planning, city development, garden suburbs, schools, churches and economic construction, and employers who fail to give these consideration will find that they are wasting time and money and must consider them sooner or later.

Requirements Differ

He must consider the home for the single man, the married man, the skilled laborer, for each demands certain consideration apart from the others. For example, the housing that has been done in this country seems to point to the fact that the $25 a week worker secures the most comfort from the two-story single family detached house, in which he can live within his means, provided the rent is not prohibitive. Just what should enter into the construction of the house can best be determined by the housing expert, who will consider the cost of improvements, the cost of the ground, situation, etc., and will decide if it is to be of wood or brick or concrete or hollow tile blocks. In the same way he will decide the construction of homes for single workers, taking into consideration their nationalities, wages, etc. Forethought in this respect is profitable for all concerned.

Steam Car with Simple System

Modern Stanley Almost Fully Automatic—Water Glass Thing of Past—Throttle Practically Only Manual Control —All Automatic Valves Powerful—No Delicate Details



BECAUSE it has been hitherto produced only upon a small scale, the Stanley steamer has received, perhaps, considerably less attention than it deserves. It is a car that will do many things impossible to a gasoline vehicle; it will start and stop on the throttle alone, it will climb hills at a high speed or at a crawl, at the driver's will; it has immense acceleration; it burns heavy fuel without any difficulty whatever; it is unaffected by heat or cold, and it has very few moving parts.

There were two drawbacks to early steam cars, or, rather, they were the same trouble in two different forms; either there were many things to watch and operate, or there were delicate automatic devices which required much understanding and fairly frequent attention. The modern steam car has none of these; they have all been swept away and replaced by simpler, stronger automatic controls, just as the carbureter and ignition systems of the combustion engine have been changed from the trouble-makers they were in 1900 to what they are to-day.

Essentially the system of a steam car is less complicated than that of the conventional automobile, if everything is considered. In explaining the operation of a gasoline car to a person who knows nothing about it, it is necessary to

1—Describe the engine, the action of the valves, etc.
2—Explain the carburetion.
3—All the details of the ignition.
4—Cooling arrangement.
5—Transmission.

After this come the smaller details, such as the wiring, the lighting and starting, etc.

The system of the Stanley steam car divides up somewhat similar. We have

1—The engine.
2—The fuel system.
3—The water system.
4—The steam system.

Taking these in order, the engine is an ordinary slide valve steam engine built up in unit with the rear axle and driving through a differential, the crankshaft carrying a spur pinion which meshes with a somewhat larger pinion on the differential itself. There are two cylinders, both double acting, steam being admitted first at one end and then at the other end of each piston in turn. The valves which control the admission and exhaust of the steam are operated from eccentrics on the crankshaft and a link motion connected to the driver's left pedal controls the range of motion of the valve. There are three passages when the valve is open for a large part of the stroke. This admits steam at boiler pressure and shuts the valve a certain distance before the piston reaches the bottom of its stroke. For the rest of the traveling the piston is driven by the expansion of the steam. Pressing the pedal forward until it catches or hooks up causes the valve to close earlier. This means that less steam is taken from the boiler and the piston is driven a longer distance by the expansion. This, of course, is more economical of steam and the condition for normal running.

The longer valve opening is used for starting and practically for nothing else. With the pedal pressed right forward the operation of the valve is reversed so that the engine will run backwards, this giving the reverse motion. After leaving the engine, the steam goes to the top of the radiator, upon passing through which it condenses into water and this water flows back to the main tank. Differing load and road conditions entail the loss of some steam, and it is this loss which has to be made up by refilling the water tank. However, sufficient water can be carried for 200 to 250 miles of ordinary running, or, in other words, it takes this amount of ordinary running before the slight loss of steam is equivalent to the whole tank full of water, which is about 20 gal.

The power to drive the car comes from the burner just as it comes from the carbureter in a gasoline car.

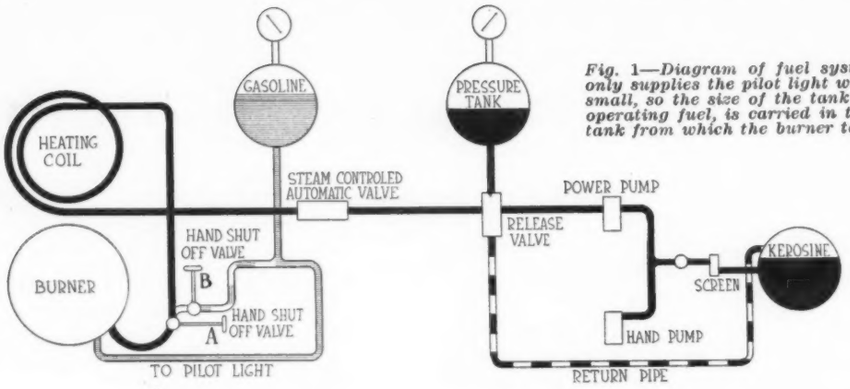


Fig. 1—Diagram of fuel system of Stanley steam car. The gasoline only supplies the pilot light which never goes out and the consumption is small, so the size of the tank is exaggerated in the cut. Kerosene, the operating fuel, is carried in the rear tank and pumped to the pressure tank from which the burner takes its supply. When the steam pressure reaches a predetermined point the supply of fuel is cut off and the kerosene pumped is allowed to go back to the main tank. The heavy black line in the cut indicates the kerosene supply, the broken black line the return lines for surplus, and the grey lining gasoline

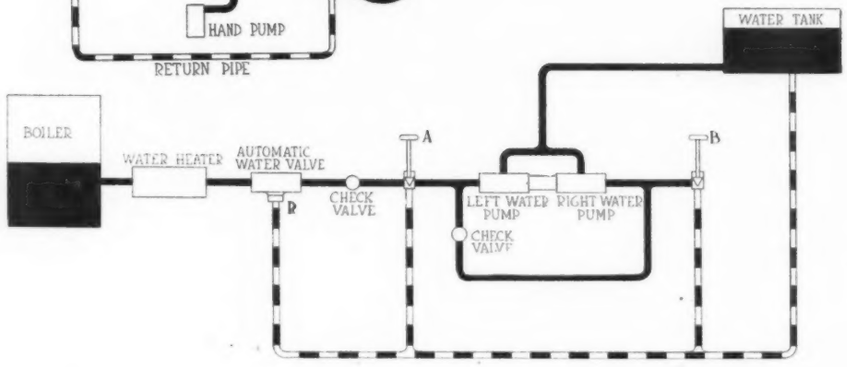


Fig. 2—Diagram of water system of Stanley steam car. Water is pumped towards the boiler by one or two pumps, according to the positions of the hand valves A and B. After reaching a proper level in the boiler the release valve R is opened and the water then goes back to the main tank, whether the pumps are both working or not. In practice the left pump always is in use subject to the automatic control, and the right pump is hardly ever called into service

Just as we have to open the throttle when we want more power from the gas car, so do we want more heat from the burner when we want more power from the steam car. It would require attention from the driver to have to control the fuel feed in any way, and therefore the fuel system has been made entirely automatic.

Imagine the boiler partly full of water and partly full of steam, the burner in operation and the car running at a normal speed along a level road. Gradually the steam pressure will increase because the burner will be making more steam than it takes to drive the car. Ultimately, a predetermined pressure of 600 lb. will be reached. Between the pump which supplies the burner and the burner itself there is an automatic fuel control valve, one side of which is exposed to the boiler pressure, and when this reaches the predetermined point, generally 600 lb., the steam pressure closes the valve and cuts off the supply of fuel. No more steam is generated until the pressure in the boiler is reduced below the cutoff point. This means that the burner continuously lights and goes out again quite automatically and without any attention from the driver.

Pilot Always Ready

Under the boiler what is known as the pilot light is continuously in operation. This is a very small burner very much like a short section of a burner from an ordinary gas stove, and this is fed with gasoline from a small tank which carries an air pressure of about 20 lb. This pressure feeds the gasoline in the form of vapor and it burns just like household gas. The little burner consumes a very small quantity; in fact, a couple of gallons of gasoline will run it for half a week continuously day and night.

In the main fuel tank there is kerosene and an ordinary plunger pump sucks from this tank and drives the fuel into a smaller tank from which there is no outlet to the air. This tank is partly full of kerosene and partly full of air, which, of course, will be under pressure. The purpose of the air is to form a cushion against which the pump will operate, thereby insuring a uniform flow and preventing the pump sending the fuel to the burner in throbs. From the tank the fuel passes on towards the burner, when the automatic fuel control valve is open, but if this automatic valve is closed then the release valve, which is an ordinary spring loaded valve, opens and allows the pumped kerosene to go back to the supply tank from whence it came.

Thus, with the car running and the fuel shut off, the fuel merely makes an idle circuit, being drawn in by the pump, forced out through the release valve and back to the supply tank.

Kerosene Vaporized

Suppose, however, that the steam pressure is not up to its maximum, then the automatic valve in the delivery line from the pump will be open. Under these conditions the fuel goes straight on through a coil which lies on top of the boiler where the kerosene is vaporized, and thence to the burner. There is, however, one other valve which is placed in the line just before it goes to the burner. This is carried up to the steering column allowing the driver to shut off the fuel by hand if he wants to do so. He would, in any case, shut it off when leaving the car.

It is not possible to light the kerosene burner until sufficient pressure has been secured in the pressure tank. To obtain sufficient initial pressure to force fuel to the burner there is a hand pump linked into the line as shown in the diagram. Requisite pressure can be pumped up in a very short time and it only has to be done when the fuel system has been thoroughly drained because the power pump has a capacity considerably in excess of that of the burner and the pressure, once there, is retained indefinitely. That is to say, it always pumps too much so that a little is continually escaping back to the supply tank.

Starting Up

There are three kinds of starting up:

1—Restarting after a short stop when everything is warm and there is plenty of steam in the boiler.

2—Restarting after a lengthy stop.

3—Starting up from dead cold.

After a short stop it is only necessary to open and close the hand-operated valve in the kerosene line a few

times as one drives off before opening it completely.

After a long stop, say of several hours, the burner may have cooled off considerably, although the pilot light will be still burning. Under these conditions it is well to open and close the hand-operated valve two or three times, before leaving it in normal open position. This may be done after the car is in motion. The object is to admit several whiffs of kerosene for warming up the burner before admitting the steady supply.

Starting From Cold

In starting from dead cold we assume the pilot light is out. On the running board is a Prest-O-Lite tank of motorcycle size, and this is provided with a short length of hose and a little gas burner. Opening a door in the mudshield just back of the front fender discloses the ends of the burner nozzles in the bottom of the boiler casing. The Prest-O-Lite burner is lit with a match, and, holding the hose in the hand, the heat is allowed to play on the nozzles for about 30 sec. Then the pilot light nozzle will be hot enough for vaporization and we can turn on the gasoline, igniting it with the torch. Then for about another half minute the torch is turned on the two main burner nozzles and it will then be possible to turn on a valve admitting a little gasoline from the pilot supply tank thereby warming up the main burner before the admission of the kerosene. This gasoline main burner valve may also be used in warming up the burner after a few hours' stand.

In an ordinary way, the pilot light is not allowed to go out for perhaps months together. It consumes little fuel, and the convenience of having it always ready is well worth while. Furthermore, it keeps some steam pressure on the boiler over night so that the time taken to make a start in the morning is quite short. However, starting up from cold is not a very serious business. It is usually done in 10 min. and by the beginner is not more than twice that time.

Water System

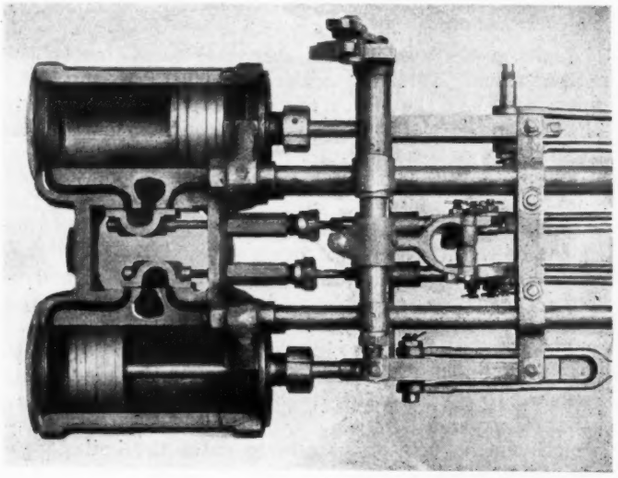
In the old steam cars one had to watch a gage glass to see that the amount of water in the boiler was correct, neither too great nor too small. In the modern Stanley this is entirely automatic, and the driver has not got to think about the water at all. It will be realized that pressure is necessary to force in the water, seeing that there is 400 to 600 lb. of steam in the boiler. This is provided by a double-acting ordinary plunger pump, or rather two pumps, both driven off the same connection. The pumps suck continuously from the water tank and discharge in the direction of the boiler. If the water is below a certain level it is pumped into the boiler, but when it rises to a predetermined point an automatic valve closes and this allows a release valve to open, whereupon the water from the pumps merely returns to the supply tank. It will be seen that this is the same idea as that which underlies the automatic control of the fuel system.

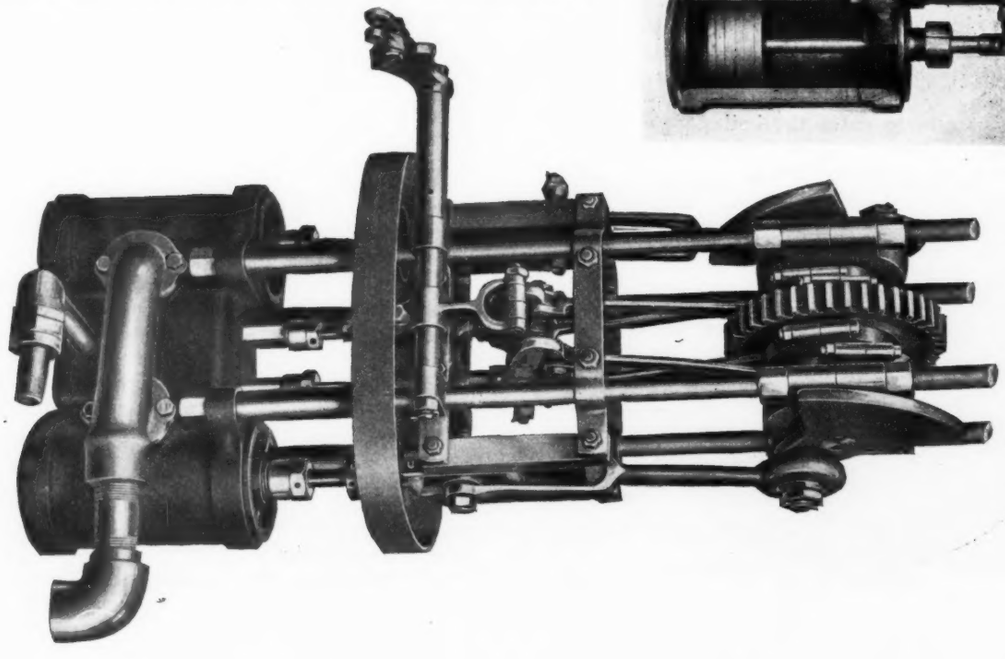
The automatic valve will be described later, but, briefly, it is a valve which, when exposed to the steam, opens and allows the water to go into the boiler, but when its boiler connection is covered with water instead of with steam, it closes and prevents the entrance of any more water. For all ordinary running only one pump is necessary, therefore the second pump is placed under hand control. Actually both pumps can be controlled by hand, but this control is only used in very exceptional circumstances.

Before Long Stop

For instance, if the car were to be left for a day or two with the pilot burning, it would be well, of course, to leave it with the boiler water at a higher level than that which is most efficient and economical for running; since that would mean more stored heat in the boiler. The hand control, therefore, can be used, during the last quarter mile or less before stopping, to fill the boiler to this desirable height.

The second pump would also be brought into play by the driver if he were driving in a very mountainous





The Stanley engine removed from its casing. The lower view shows the link motion for varying the cutoff point of the slide valves and for reversing, the upper view shows the valves in section. All the bearings are ball bearings. The spur gear on the crankshaft meshes directly with a corresponding gear on the differential, the ratio being 1.3 to 1

district or through very deep sand where exceptional power is required. In a rough sort of way you might say that when it is necessary to run continuously with the engine valves opening to their maximum extent, then it will be necessary to have both pumps in action, but in an ordinary day's driving where the full stroke of the valves is only used for starting, it is never necessary to have more than one water pump at work.

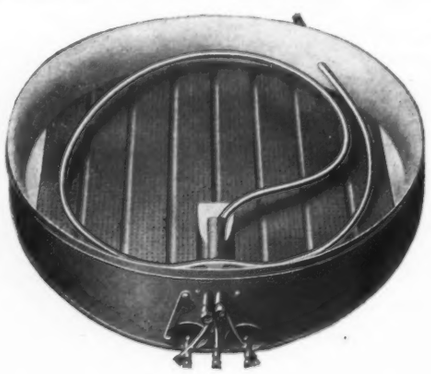
Automatic Water Feed

Fig. 2 shows in a very diagrammatic way how the different parts of the water system are interconnected. It will be seen that there are two needle valves, A and B, furnished with hand wheels. Consider first the right end of the pump with the valve B open; water will be sucked in and discharged down the return pump back to the tank, but as soon as we close B the return passage is shut off and the discharge from the right end of the pump will go round the loop and connect up with the discharge from the left pump. Now as long as valve A is open, the discharge from the left pump will go back through the return pipe to the tank and if B is closed but A open the discharge from both pumps will still go back to the tank. If A is closed the discharge will have to pass along the line towards the boiler. Between the right and left ends of the pump, however, in the loop shown in the diagram there is a check valve, and this prevents any water pumped by the left end from passing back towards the right end, so if we close B and open A the left end of the pump will be delivering into the boiler line but the right end of the pump will be doing nothing except to idly suck water from the tank and send it back again. This is the condition of normal running.

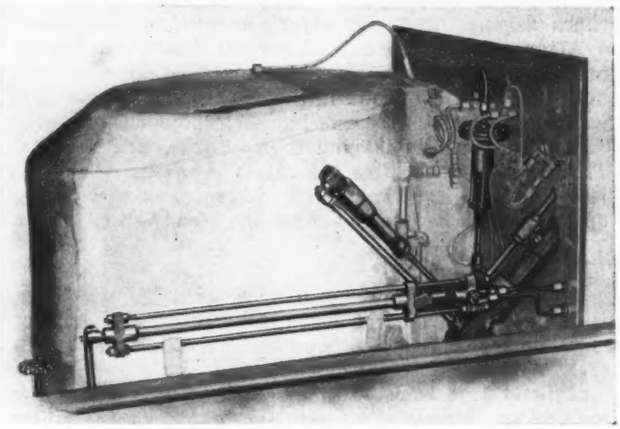
Valve Is Simple

Leaving the pump, the water goes to the automatic water valve. If this is closed, the release valve will open, allowing the water to return to the tank, but if the automatic water valve is open the water will then go on through the feed water heater and into the boiler.

The automatic water valve is very simple and merely adapts one of the oldest principles in mechanics. The steam is, of course, hotter than the water. On the side of the boiler is a length of brass pipe. One end of this connects to a hole in the boiler and the other end is closed. Suppose the pipe is full of water owing to the hole in the boiler being below the water level, and then suppose the water is reduced until the hole is uncovered, which will allow the water inside the pipe to be replaced by steam. The steam being hotter causes the pipe to expand, and this expansion closes the valve which causes the water again to enter the boiler. As soon as the water level has risen to such a point that the hole is again covered, steam being cut off from the pipe, it cools, contracts, and thereby opens the valve



Burner and pilot light in bottom of boiler casing. The coil of pipe seen is the steam superheating coil, or rather a portion of it



Left side of boiler. Connected to the foot of the steering column and sitting at an angle of about 45 deg. is the throttle, high on the boiler side. The three parallel rods seen lying horizontally are the low water automatic cutoff. The center of the three is a tube which is normally filled with water, being below the minimum water level. If water falls below this point steam expands the tube by heating it and this closes a valve in the fuel line that cuts off the supply to the burner

and prevents any more water coming in until such time as the level in the boiler has again fallen.

The real beauty of this valve is the absence of any small or delicate parts. There is almost irresistible power in the expansion of the pipe.

The Steam System

We have described how the level of the water in the boiler is kept constant within a range of about 2 in., and how the fuel is automatically supplied to the burner as long as the maximum pressure is not reached and automatically cut off as soon as the maximum has been attained. It remains only to describe the detail of the boiler.

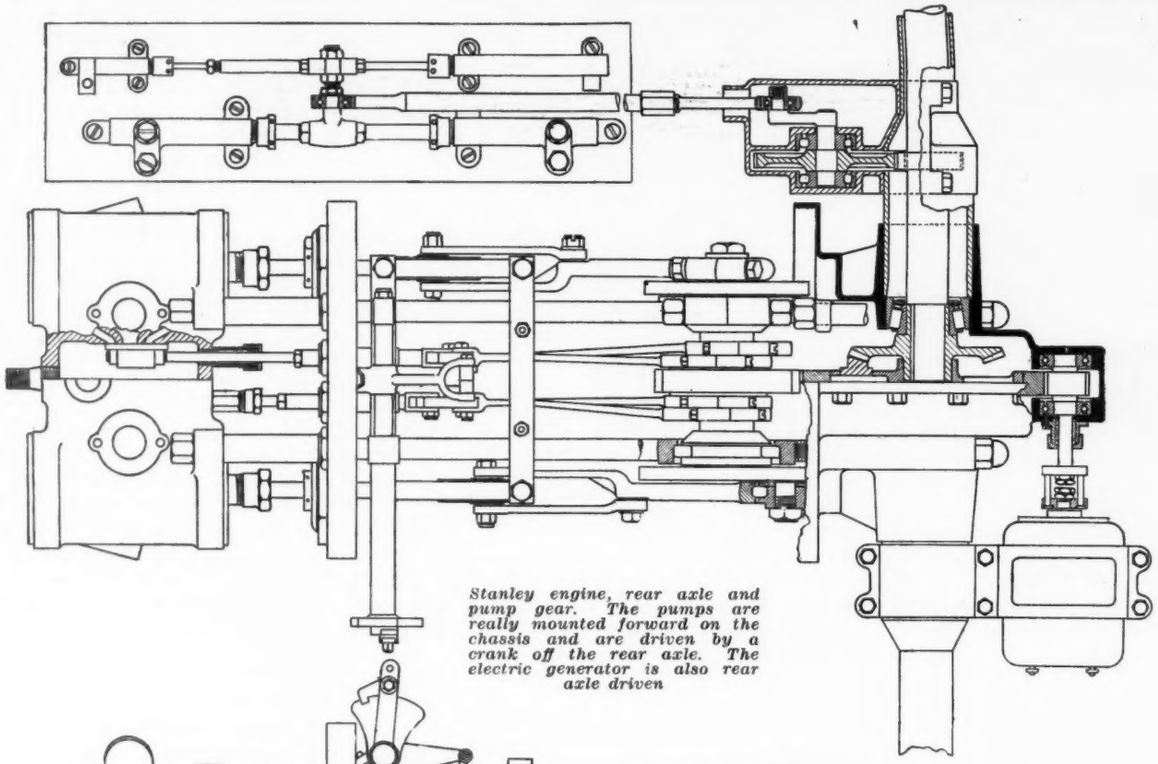
The boiler is a drum standing on end, with the burner beneath it. The lower head and shell are one piece of pressed steel. The upper head is welded in. The shell is merely a container, and is wound with three layers of piano wire, just as modern cannon are wound. There is a large number of ½-in. tubes passing vertically through the drum. These are welded into the lower head, and expanded into the upper head. Thus the strength of the shell is many times greater than that of the tubes.

The heat from the burner passes up through these tubes. The whole boiler is covered with asbestos lagging to retain the heat, and the products of combustion are carried away so that they do not heat up the front compartment of the body. There is no more heat to be felt in the driver's seat of the Stanley than in any gas car. In fact, there is less than in some where the exhaust pipe comes close underneath the toeboards.

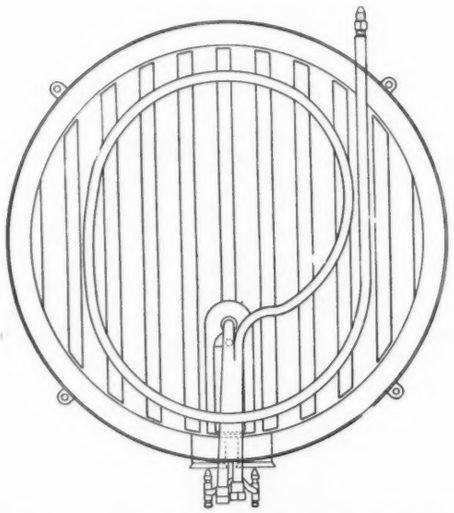
Just below the boiler and above the burner, and fully exposed to its heat, is a short coil of pipe, which is connected to the throttle by a tube passing through the boiler. The steam passes through this on its way to the engine, and in doing so all the moisture is taken out of it. This is called the super heater. But the steam after passing through the superheater and before reaching the engine passes up through to another boiler tube again, so that its temperature will be at all times equalized and it will reach the engine in constantly uniform condition.

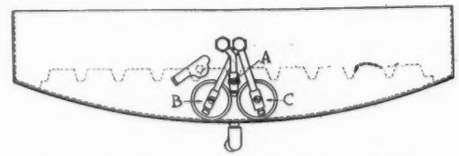
The throttle is controlled by a lever just beneath the steering wheel. It is an ordinary piston throttle which merely opens and closes the pipe leading to the engine. It is only on very rare occasions that it is necessary to open the throttle more than about one-third of its total

Detail Engineering Features of Stanley Steam Car

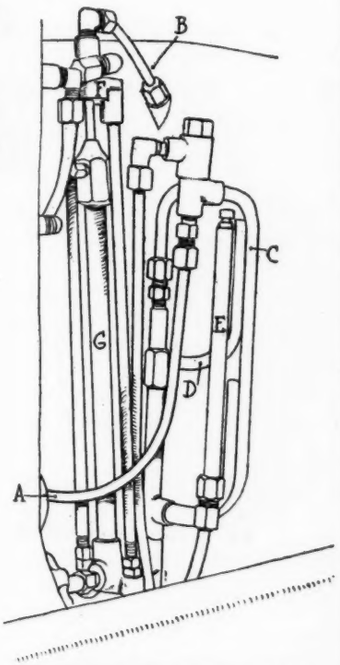


Stanley engine, rear axle and pump gear. The pumps are really mounted forward on the chassis and are driven by a crank off the rear axle. The electric generator is also rear axle driven

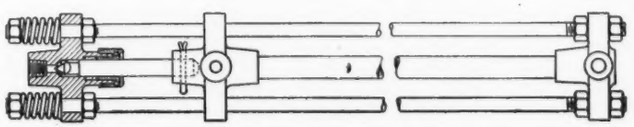




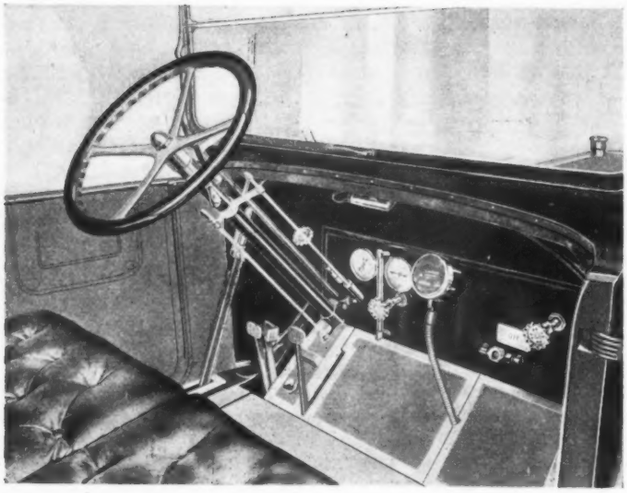
Stanley burner. A is the gasoline nozzle for the pilot light and B and C the two main burner nozzles



The automatic water control valve and water indicator details on side of boiler



Automatic Valve in Section



Driving compartment of Stanley steam car. The two attachments on dash to right are the charge and discharge indicator for the electrical equipment and the sight feed oil indicator

travel. Half opening on a level road corresponds to about 40 m.p.h. After leaving the engine, having done its work, the steam goes into a long cylinder and thence to the radiator where it is condensed into water and returned to the tank.

The cylinder just mentioned is the feed water heater, the water being carried through it in a long loop on its way to the boiler. This has a double purpose. For one thing, the steam warms the water, thereby somewhat reducing the amount of work the burner has to do, and simultaneously the water cools down the steam so helping to condense it and lessening the amount of cooling which has to be done in the radiator.

On top of the boiler are several turns of pipe which are used to vaporize the fuel. The kerosene passes through this on its way to the burner, as already mentioned.

Oiling Is Automatic

In the foregoing the whole system of the Stanley steamer is explained with the exception of engine lubrication, which is also automatic. The whole engine is enclosed and works in a bath of lubricant, and the whole consumption of oil is extremely small. There is a reserve tank of oil carried on the chassis and a minute plunger pump tandem with the water pump. This little pump sucks from the tank and delivers to a sight feed on the dashboard whence the oil goes to the engine cylinders. The feed is very small and very slow, amounting to perhaps two or three drops a minute.

Pump Drive on Axle

Turning to some matters of smaller detail, the drawings on page 453 may be studied. The larger shows how the pumps are driven off a crank which is operated from the rear axle. From this crank there is a long rod inclosed in a tube, allowing the pumps to be mounted well forward on the chassis where they are accessible upon lifting the floor boards. The double pump on the lower side is the water pump, and of the upper pair, that on the right is for fuel and the left one is for oil.

In the same drawing the generator drive is shown and it will be seen that the generator is attached to the rear axle, having a pinion to drive it which meshes with the large differential gear. The electrical lighting system is in no way peculiar in detail but is, of course, very simple as the only circuits are the lamp circuits.

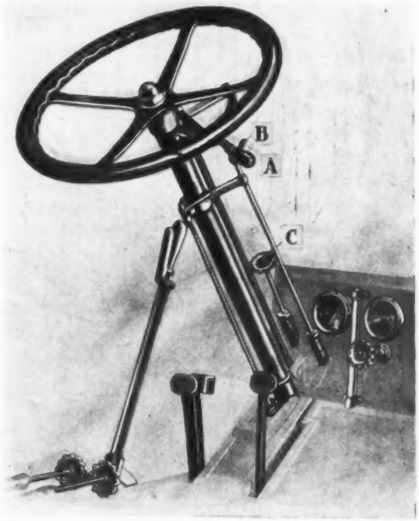
The center cut at the bottom of the page shows that automatic water control mechanism and the end of the indicator. The large pipe *G* is connected to a vertical stand pipe inside the boiler and when this is not covered by water steam enters *G* and causes it to expand because of its increased temperature. Water is all the time being pumped to the valve chamber *F* and when *G* expands, this valve opens and the water goes through the pipe *B* into the boiler. When the internal stand pipe is covered with water *F* shuts again and prevents the entry of any more water.

A quite independent control shown in the same cut is that for operating the water level indicator on the dash. *E* is a pipe closed at the upper end and connected by the curved pipe seen beneath, to the bottom of a vertical glass tube on the dash. This tube is open at the top and contains water, *E* being completely filled with water and containing no air. The curved pipe *D* is connected to the boiler, and water is continually pumped through *C*. The three pieces *D*, *E*, and *C* are brazed together.

If steam enters the stand pipe *D* it heats up, and when hot enough will vaporize some of the water in *E*, and this will cause the level of water in the dash glass to rise. Over a range of about 3 in. the temperature of *D* will vary roughly in proportion to the level of the water so that as the level in the boiler *sinks* that in the dash glass *rises*. The reading is only comparative, of course, and the gage is not really necessary, its only purpose being to show the fact on the rare occasions when both water pumps are required or if the water tank should be empty without the driver noticing the condition of the tank gage, which is set in the floor of the front compartment and is exactly like a gasoline tank gage.

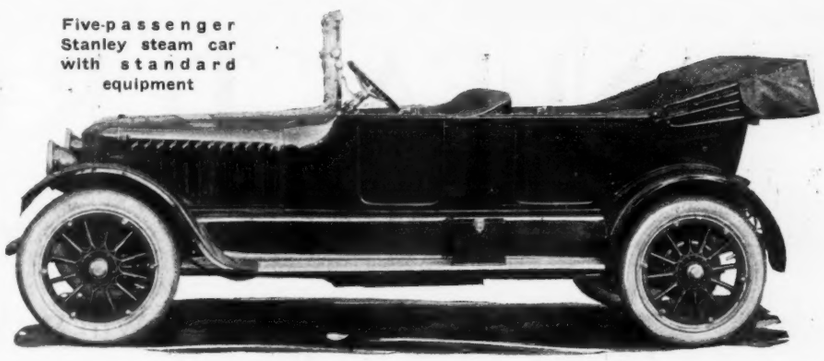
Superheats in Special Way

A detail of the steam superheating system which is important may be elaborated upon a little, this being the placing of the throttle between the boiler and the heating coil. The main purpose of superheating is to dry the steam and prevent the passing of water to the engine. To dry steam first and then throttle it, is



What the driver uses. The left pedal gives the two valve positions for forward running and the reverse. It is pressed forward half way after starting and left there. The right pedal operates a rear axle brake, the lever another brake. A is the throttle which is the only control used while running. B, a little lever partly concealed by the throttle lever, is for shutting off the fuel when making a long stop. C is only used when starting from dead cold. It is the valve turning gasoline into the main burner. On dash the left gage shows the fuel pressure and is seldom looked at. The right gage is the steam pressure. In the center is the water glass that is only carried as an emergency indicator in the event of any trouble in the water feed system

poor practice, because the action of throttling is provocative of condensation. Also the superheating coil does not go direct from the turn of pipe above the burner to the engine, but is carried up through the inside of the boiler first. This is to prevent steam going to the engine in too hot a state. When running slowly with very little steam passing it would be possible to overheat the steam and this is not the best thing for lubrication as burning steam is harsh upon the oil. Taking the steam through a pipe within the boiler after it leaves the superheating coil allows it to cool off if it is too hot.



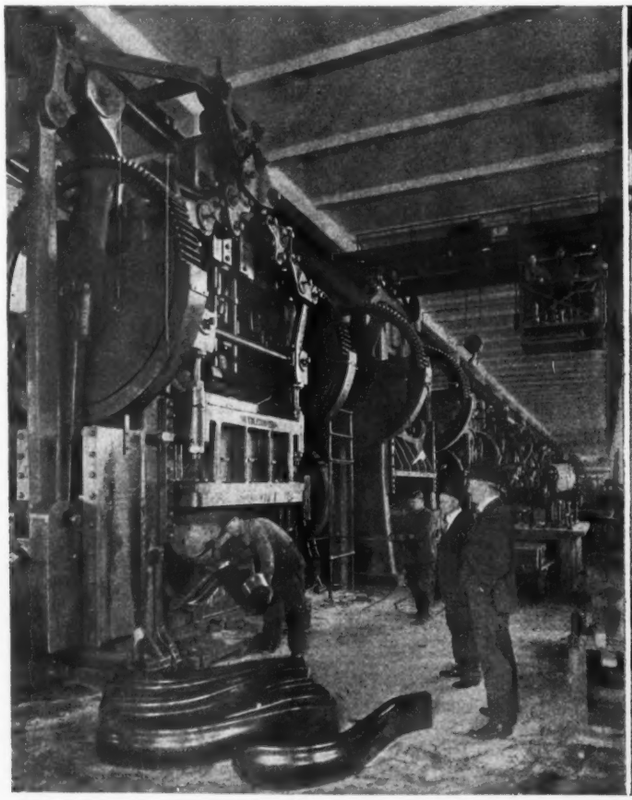
Five-passenger Stanley steam car with standard equipment

Stout Detail Construction

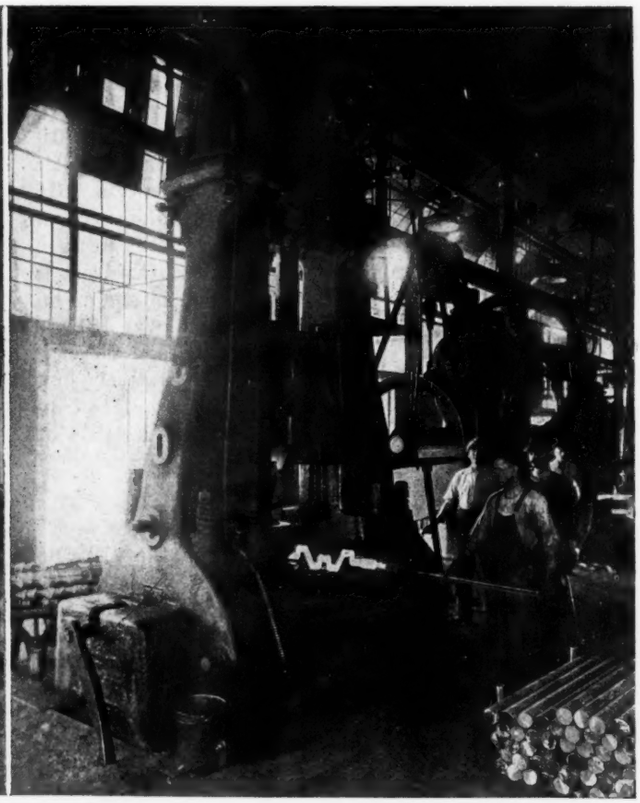
Although the point was made before, it should again be stated that all the automatic portions of the Stanley system are strong and substantial. The first reading of a description of a steam car always tends to suggest that there is a great deal to understand but so does the first reading of a booklet on the conventional type of car. A man knowing nothing of either steam or internal combustion engines might easily find the steam system the easier to comprehend. As to reliability there is nothing on the Stanley as delicate as either the carbureter or the ignition gear of a gas car so far as adjustments are concerned. For example there is a very ingenious method for keeping the nozzles of the burners clear. It will be noticed in the illustrations that each nozzle has a screw in it, but these screws are not adjusting pins. Each screw has a wire attached to it, and the wire sticks through the nozzle. On the side of the wire is a flat which allows fuel an easy entrance to the burner. To keep the nozzles clear the screws can be turned round a few times, this rotating the wire in the nozzle and clearing out any small obstructions without affecting the size of the orifice.

It would be easily possible to give other examples, but enough has been said to show that there is nothing to be afraid of in a modern steam car. The steam car can be learnt as easily by a beginner as any other sort of car.

Making Crankshafts and Fenders for Dodge Cars



Above is illustrated the type of press used in the Dodge Bros. plant to make fenders. It exerts a pressure of 900 tons per square inch



Crankshafts used in Dodge Bros. cars are drop-forged. The method of manufacture followed at the company's factory is illustrated above

MANUFACTURERS' MERCHANDISING

Manufacturer to Distributor, Dealer, Buyer

Fourth Article of The Automobile's New Department

New England's Buying Power Will Be More Intensively Cultivated 3 Years Hence—Psychological Peculiarities

NEW ENGLAND can and will be more intensively sold at the end of 3 years from now than it is at the present time. The buying power of New England is enormous, and, although manufacturers have not failed to turn their attention to the richness of the territory, it has never been cultivated as closely as is possible.

Prominent manufacturers state that from 8 to 13 per cent of their output goes into the five New England States: Maine, New Hampshire, Vermont, Rhode Island, and Massachusetts. Connecticut, from a distributing standpoint, is not altogether a New England state, but taking that part of Connecticut which is handled from distributing centers outside of New York, a considerable part of it falls into the New England territory.

Field Is Being Cultivated

To give an idea of the value of this territory, it may be stated that 12 per cent of the Packard output goes into this territory, or, as another example, better than 13 per cent of the Cadillac output is sold in that territory. The rapidity with which the field is being cultivated may be noted from the fact that the Cadillac sales in New England increased 37 per cent in 1916 over those of 1915. In the Studebaker sales in New England there was an increase of 70 per cent in 1916 over 1915, and all through the list of manufacturers it is almost invariably the case that the percentage of increase in the New England sales in 1916 over 1915 is slightly in advance of the general percentage of increase throughout the country. When the comparatively limited districts of the New England distributor are considered in comparison with those of other sections of the country, the fact that New England is capable of being intensively cultivated will be appreciated.

General Selling Plan Unchanged

In handling the New England territory, there are no differences in the broad selling policies established by a manufacturing concern for this part of the country as compared with others. The same method of distribution is generally used; the same branch, dealer and subdealer contracts are employed, and the entire scope of the distributing plan is exactly in line with what is used in other localities. Nevertheless, in the detailed application of the plan there are certain differences caused by the particular psychology of the New Englander and by the conditions of the country in which he lives. The New Englanders are thrifty and careful buyers; they are descendants of people who have made their way through adversity, and this is reflected in the method of buying. The people of provincial New England are different in a great many ways from those who live in Boston, and it is in the more provincial districts that one must go to find the true New England character. The successful man of rural New England is a self-made individual, inclined to be clannish and, almost always, thrifty. In a word, he is conservative, and there are many sales managers at different factories who look at New England with the perspective given by the distance from Detroit, and say that conservatism is the badge of the New Englander. This conservatism is not preventing the New Englander from buying cars. It is, however, making him a more careful and more exacting buyer than the occupant of any other part of the country; and, quoting one sales manager who has made New England his special study, it takes a higher order of salesmanship to sell the individual New Englander than it does the dweller in other parts of the country.

Characteristics of States Differ

The States of New England vary greatly in their characteristics and causes of wealth. The State of Maine is probably the only State in New England which cannot be truly called a manufacturing State. The wealth of Maine has been amply summed up by one manufacturer as due to potatoes, apples and visitors. Lumber is a fourth consideration; canned fruits and corn are also wealth producers in that State. The other States are more varied in their industries and, of course, the well-known manufacturing districts have their own particular wealth characteristics.

One point in which New England excels is its fine roads, and close students of automobile distribution have found that the intensiveness with which a certain territory can be sold depends greatly upon the development of roads in that particular territory. New England is unexcelled for its fine roads and beautiful scenery. The country is filled with historic spots and is occupied yearly by thousands of tourists. The effect of these tourists in going through the country is stimulating on local sales.

Boston a Good Market

It is not only throughout the country, however, that the New England dealer need turn for his prospects. There is no richer buying city than Boston, and Boston dealers state that in ratio to population they sell as

many cars as any other city in the country. The Studebaker company sells in Chicago one car to every 3000 people. In other parts of Illinois the ratio is 1 to 1500. In Boston, the ratio is higher than it is in Chicago, and in other parts of Massachusetts the ratio of cars to population is higher than in any other State in the country. Boston is a good commercial car city. Throughout the other parts of New England the conservative element again crops up, in that the truck salesman finds it necessary to show a man substantial proof as to how he can improve his business by abandoning the horse in favor of the commercial vehicle.

The way in which New England is developed by a company depends greatly on how it got its start in that territory. For instance, Cadillac, which counts New England as among its best territories, has been selling in that district for 13 years. The company has ten direct dealers who, in turn, have their sub-dealers who cultivate the territory. Naturally, the territorial division of a company which built up its sales policy in that country 13 years ago will differ somewhat from the policies of other companies which started later and made different divisions of the territory. The advantage, however, of this gradual method of cultivation, which is bound to produce irregular selling territories, is in the value of acquaintanceship. The clannishness of New England is well recognized, and it is for this reason that the most generally successful salesman in New England is a New Englander himself. There are some who believe that it takes a New Englander to sell a New Englander.

It is in this point of individual contact that selling in New England differs from selling in other parts of the country. Owing to the fact that the country is divided up into a network of good roads and that touring has always been popular throughout the entire territory, New Englanders know their country better than the average person does in other parts of the United States. This all reflects in the buying and selling of cars. It is necessary for the salesman to establish an advantageous connection between the car he is selling and the country in which it is to be used. New England, although it has good roads, is hilly, and it requires the best that is in a car to give the service demanded.

Cutting Down Territories

With the notes given on the individual characteristics of New England sales, the points of difference between that particular territory and other parts of the country cease. There is one great outstanding fact, however, which is probably realized in every factory sales office, and that is in spite of its geographical compactness, it is capable of being more intensively cultivated than is at present the case. Throughout the entire country there is a tendency toward cutting down territories, either by giving the direct dealer smaller territory or by doing everything to discourage the number of sub-dealers under him. This move has been going on very noticeably in New England for 2 years, but it can be accelerated to great advantage. The methods used by one or two factories could be cited to advantage:

The Hudson Motor Car Co. disposes of its output not only in the New England States but through the entire United States through distributors established in various centers, each having a certain territory allotted to him. These distributors, in turn, dispose of a certain proportion of cars allotted them for their respective territories in a retail way from the home office. The sales throughout the balance of their territory are handled either through a branch of the distributor's or through dealers operating under selling arrangements with the distributor. Each of these branches or dealers has an assignment of a certain defined territory by the main distributor. In New England the Hudson company has distributors at Boston, Brattleboro, Bridgeport, Fall River, Hartford, Manchester and Springfield.

The King company handles its New England territory in very much the same way. It has its main direct dealers who, in turn, sub-distribute the cars. The King company has direct dealers at Boston, Bangor, Providence, Hartford and Springfield.

Another concern which follows this same method is the Packard Motor Car Co. This concern has direct dealers at Boston, Mass.; St. Johnsbury, Vt.; Burlington, Vt., and Rutland, Vt.

Packard's Largest Dealer

The Packard Motor Car Co. of Boston, of which Alvan T. Fuller is proprietor and owner, is the biggest independent dealer that Packard has in point of business produced, and is recognized second only to New York, which is a direct factory branch. The territory handled by the Packard Motor Car Co. of Boston includes the following counties and States, and it is upon their influence that the Packard company depends for its New England business. The counties are: Barnstable, Bristol, Plymouth, Norfolk, Suffolk, Middlesex, Essex, Worcester, Dukes in the State of Massachusetts; counties of Rockingham, Hillsboro, Cheshire, Sullivan, Merrimac, Belknap, Strafford, Carroll in the State of New Hampshire; and the entire States of Maine and Rhode Island.

Ten Direct Cadillac Dealers

Cadillac has ten direct dealers in New England. This is the concern which has built up its New England territory gradually and from widely scattered points. The relative importance of the different territories cannot be told by the locations; in fact, it is quite possible with this sort of an arrangement for a stronger dealer to be located in a territory not naturally so advantageous. One dealer handles Maine from Portland; another handles part of Vermont and New Hampshire from White River Junction, Vt.; then there is the Vermont Cadillac Co., with headquarters in Barre and Burlington, Vt. The Boston dealer, the Cadillac Automobile Co. of Boston, handles eastern Massachusetts, except Taunton and the extreme east, where the Robertson Motor Car Co. takes in such territories as Taunton, Fall River and New Bedford. There is a dealer in Worcester; another in Springfield, and another in Providence. Connecticut is handled by some Connecticut dealers and also from New York. Those in Connecticut are located at Hartford, New Haven, and Norwich. The Norwich dealer includes Bedford and New London.

Spoiled Salesman's Standard Approach

An interesting side feature on car sales in this territory may be noted from the fact that it was the New England territory which really spoiled the idea of hav-

ing standard approach for salesmen in one particular concern. It was found that the New England buyer interrupted the process of standard approach very quickly by his pointed questions and his buying tactics. The Yankee has always been known as a shrewd bargainer, and the character portrayed in David Harum is not altogether absent from provincial New England, although the Boston man is very much the same as the man of New York or Chicago.

One of the features of New England sales psychology which is interesting in that the lower in the price scale sales are being made, the more conservative type of buyer will be met in a great percentage of instances. The reason for this is that the buyer of the higher-priced cars is generally a man who has traveled to a greater extent and has lost the clearly defined characteristics possessed by the New Englander, especially the provincial New Englander who has always remained close to his own fireside. The territory is rich, however, and an ever-increasing number of sales are to be made.

French Makers Discuss U. S. A. Competition

IN a recent issue of *The Motor* (London) it is stated that some questions were put to a number of French automobile manufacturers by a French paper, *La Vie Au Grand Air*, The queries were as follows:

1. Do we seriously have to take precautions against an invasion of American cars?
2. Are we in a position to keep ahead of American competition?
3. Can we at the same price supply equally good cars as America?

The replies hereunder seem to indicate a lack of appreciation on the part of the French industry as to just what sort of competition they have to face, that of De Dion being particularly amusing:

Alda (Charron): "Let us be thankful to the American industry. They have converted many to motoring with their cheap cars, many later became and remained our clients. The best way of meeting the invasion is to form a syndicate with millions of money which will build one cheap type of car."

Brasier says: "We must do away with competition among ourselves and our makers must all agree to a general business program."

Clement: "We can never reach the low production price attained by the Americans, as we shall never be able to produce in such large quantities. The best way to fight is to have protection by import taxes; further, we must keep to our better quality and an agreement between firms to produce one model only."

Delage: "If we do not take precautions we shall be ruined by the American danger. It is to our advantage that French cars do not have freightage cost, import duties, and further French patriotism which will give the preference to French cars."

Lorraine-Dietrich: "As long as we have not the plant for mass-production so long shall we not be in a position to compete on the point of cheap cars. We must, therefore, lay ourselves out for the building of 'Luxe Autos.'"

De Dion-Bouton: "We have no need to fear America. In America no repairs are carried out; one buys a new car. The number of models in France will have to be reduced in order to reduce the production costs. Further, we need import taxes to protect us. An agreement is necessary among the manufacturers not to compete against each other by making similar models."

Peugeot: "We shall chiefly concern ourselves by building 'Luxe Autos,' as America can only compete with us with their cheap cars. If a French firm was planned to produce one model to the number of, say, 10,000 cars per annum, this car would be preferred to American cars. American manufacture is not the same as the French and does not appeal to French taste."

Satisfied with Old Methods

Panhard & Levassor: "The American over-production will soon come to an unavoidable crisis—earlier than one thinks. American cars are built for the bad American roads, and have therefore but a limited speed. They are not suitable for the magnificent French roads. Our old method of production will give us sufficient to do in the future."

Renault: "We have no time at present to concern ourselves with the American danger. If, however, there is danger in spite of import duties, then we shall pit their quantity against our quality. Only a certain class is capable of employing cars in France, and a Frenchman used to the lines of a French car prefers to pay a little more for a car which is capable of running 4 or 5 years."

U. S. A. Armored Truck on White Chassis

THE United States Army now has in service a fleet of armored motor trucks like the one shown in the accompanying illustration. This truck, built on a 1½-ton White chassis with steel wheels, was armored at the Rock Island arsenal from designs by government engineers.

Soon after this truck was placed in service at Fort Bliss, Texas, several others were sent south for border duty. All these vehicles have revolving turrets, carrying machine guns that shoot 600 shots per minute, and their armor is proof against rifle fire.

New England Machine Tool Makers Months Behind Orders

Automobile and Truck Makers Take Nearly 50 per Cent of Greatly Increased Output—Tools Are Bought More Carefully Than Formerly—Foreign Market Continues Strong—Possibilities After War

By Donald McLeod Lay

NEW ENGLAND, while no longer the great automobile manufacturing center which it was in the early days of the industry, produces the great bulk of the machine tools and special machines that have made possible the enormous output characterizing the industry to-day. Moreover, as the automobile and motor truck industry has grown so has the machine tool industry found expansion necessary, especially the big companies located throughout central and southern New England. During 1916 these concerns found the heavy demand from automobile and commercial vehicle manufacturers, which had been increasing from year to year, greatly intensified and at the present time practically all the machine tool makers in New England are so loaded up with business that the earliest date of possible delivery on new orders is given as sometime next November or December.

Editor's Note: — The information contained in this article was obtained by interviews with a large number of the leading machine tool and special machine manufacturers of New England. No individual companies are mentioned as the conditions described are practically common to all. When the tool builders held varying opinions as to future developments, etc., these views fell into groups, and are so considered.

Almost all these New England machine tool makers enjoy a good export trade with European manufacturers in times of peace and during the past 2½ years of war the foreign demand has naturally increased to much larger proportions. Very few of the machine tool firms have gone into the actual manufacture of shells, rifles or other war munitions and such contracts for supplies of this sort are now almost entirely filled with no prospect of further orders. All the companies but one or two, however, report a continued increase in machine tool requirements by foreign countries and the general expectation among the manufacturers is that a considerable part of this large export business will continue after the close of the war. Just now most of the machines ordered for use in foreign countries are needed for munitions manufacture, both as equipment to new plants and to replace tools worn out under the severe continuous service conditions necessitated by excessive output demands. They are lathes, automatic types being specified in most cases, planers, drill-presses, grinding machines, etc., in fact, every variety of modern factory equipment in this field.

A large proportion of the machine tools going into the foreign market are consigned to companies manufacturing automobiles and motor trucks in times of peace and whose factories are still engaged, at least to some degree, in such work, although they have been taken over by their respective governments for turning out war munitions. It is reasonably to be expected that upon the conclusion of hostilities the enlarged facilities, including the American machine tools now being installed, will be utilized entirely for the production of cars and trucks. This means a greatly enlarged output on the part of European manufacturers which must be considered as a probable factor in the world's market for automobiles and motor trucks after the war.

In considering the machine tool industry of New England, however, it must be remembered that the demand of American manufacturers preponderates to a marked degree in the total output. A census of this industry revealed that nearly 50 per cent of this total output goes to automobile and motor truck manufacturers of the United States, the lowest percentage reported being 5 per cent by one company and the highest 75 per cent with a number of other concerns showing over 50 per cent and practically all the rest grouped between 35 and 50 per cent. The percentage going to the automobile and commercial vehicle industry in 1916, however, was considerably higher than at any time during the previous 5 years, the average during this period being slightly over 30 per cent. Moreover, one very important fact must not be overlooked. Not only has the percentage increased, but every one of these concerns has greatly enlarged its output during the past 2 years so that the higher percentage figures for the automobile and truck industry mean a much greater volume of machine tools.

Automobile and motor truck manufacturers are among the most intelligent that the machine tool builders supply. This is the opinion of practically every tool maker in New England. Car and truck makers work hand-in-hand with them, they say, and thus obtain maximum results at minimum expense.

Tools Are Bought More Carefully

The only change in the method of buying machine tools which was remarked as characterizing the past year is that tools are no longer bought in the helter-skelter, hit-or-miss way which was formerly common. Also more attention is paid to the possibilities of utilizing the tools for other purposes than those for which they are originally intended.

Some aspects of the present demand for machine tools are: Almost every variety of tool is in immediate and heavy demand in the United States, planers, shapers, all sorts of lathes, drill-presses, etc. All sorts of tools are needed in France and in England. Italy has need of more tools, especially lathes. In fact, our machine tool builders are rushed to the limit of their capacity and there is no prospect of a let-up.

It is somewhat enlightening to know that the general aver-

age percentage of the export business being carried by machine tool makers is approximately one-eighth to one-fifth of the total production.

Most of the export business of the New England machine tool industry is transacted through jobbers or foreign dealers. The manufacturers endeavor to keep track of their machines for the purpose of ascertaining whether or not they are satisfactory for the work they are called upon to perform and also to facilitate replacements when the necessity arises for new parts. Also, they often receive photographs from users of their machines showing unusual adaptations or perhaps suggesting improvements in design or construction. These come from all parts of the world, one specific example being sent from the Panama Canal Zone, illustrating a standard gear-cutting machine especially mounted and arranged to handle gears much larger than its rated capacity, not only in size but also in weight.

Russia Needs Machine Tools

In the foreign situation one of the most interesting and significant developments is that Russia is really beginning to awaken to its industrial possibilities. Numerous inquiries as to the possibility of shipping machine tools to Russia in the near future have been received by many makers and a considerable amount of actual business has been done, but the great difficulty in dealing with Russia at the present time is that her financial arrangements are entirely inadequate. Private individuals and corporations are practically powerless to purchase in the American market at the present time except on long-time credit, as the government has need for all the available exchange. Some of the New England machine tool makers and concerns allied with them, however, have gone into the Russian market and are doing a very large business with every prospect of increasing it materially upon the close of hostilities.

Machine tool makers are not planning for any great demand from the farm tractor or aeroplane industries in the near future and are counting upon their standard machines to meet any that may arise. Of course, if special types of machine or variations of present types are needed, due to rapid expansion in these fields, the tool makers will provide the necessary equipment.

Work for Permanent Trade

It is characteristic of the men directing the great machine tool trade of New England that the individual companies build for permanent business, and, although competition is very keen, salesmen are never allowed to recommend machines that are not suitable for the work to be done, even though it means the loss of an order. The manufacturers consider that it is more to their advantage to recommend a competitor's machine if it will do the work better than their own since such a procedure establishes in the mind of the customer a strong impression of the firm's integrity and dependability that will result in other orders in the future. This spirit predominates throughout the entire New England group of machine tool makers and the result is that the customers' needs are considered first of all, a practice which is not only praiseworthy from an ethical standpoint, but also better business.

Working Night Shifts

Night and day operation is almost general practice in New England factories to-day. Machine tool plants are no exception to the rule, many of them finding night shifts necessary for a long time to come, according to present indications. Others work overtime in some departments whenever the production schedule demands increased output. As in the automobile industry, the various departments of a machine tool plant must keep their output balanced or otherwise the production of the completed tools is hindered. Still others put on night shifts only when it is necessary to turn out a big order in a short time.

In passing through central and southern New England on a night train brightly lighted factories are visible on both sides of the railroad at the outskirts of every town and even here and there in the less thickly settled districts. Textile mills are all running night and day in their endeavor to supply uniforms and other clothing to European nations whose mills have all been turned into munitions plants. Ship supply plants are rushing work on material for the numerous new vessels now under construction in the New England shipyards, to say nothing of the great numbers of old ships that are being rejuvenated to meet the demand for shipping facilities. Automobile accessory plants are working overtime to supply equipment for the thousands of cars being turned out of the factories in Detroit, Cleveland, Toledo and other car and truck manufacturing centers. In fact, nearly all manufacturing New England is working night and day to meet the unusual demands largely arising, either directly or indirectly, from war conditions.

Manufacturers of special machines report that the demand for constructions designed to meet individual manufacturing problems is very heavy. Some of the largest makers of these machines are located in New England and they state that the automobile industry is one of the most prolific in furnishing them opportunities for the development of special machines of all sorts and sizes. Frequently car and truck makers invite the special machine maker's experts to go through their plants with the object of suggesting where time, factory operations or material could be saved by the installation of special machinery. These visits are usually productive of a considerable saving in cases permitting of such improvement of manufacturing methods, and if the machine maker's representative considers that to attempt an installation would be unwise, from the viewpoint of either efficiency or economy, or both, he does not hesitate to say so.

Special Machines in Demand

The present demand in special machines is very strong, the automobile industry playing an exceedingly important part in the creation of this demand, both in this country and in the European market. In regard to the interest evinced by European automobile and truck makers in special machines, which might serve as an index to their intentions in regard to embarking upon quantity production upon the close of hostilities, there seems to be some attention paid to the possibilities of such machines, but, as several of the machine builders put it, "not to any greater extent than by American manufacturers." This may contain a world of meaning, however, as the general impression gained by interviews with some of the machine makers was that the automobile and truck manufacturers of the United States are as keenly interested in their products as could be wished.

Foreign Peace Market

Opinions differ somewhat as to the probable market for American machine tools in European countries after the war. It is fairly generally conceded that the present demand will continue for some time after the declaration of peace, but as to the length of time this condition will endure, as one tool maker said, "That's anybody's guess; and probably one man's conjecture is as good as another's in so far as present indications serve as a basis."

That a very large quantity of machines will be required to replace the equipment now being worn out by high-speed, overload factory methods in the mad race for munitions supremacy is evident to everyone. As to how large a part of this demand will be met by European products it is impossible to say, but it is a well-recognized fact that American machine tools must be shipped abroad in considerable quantities for a long period after the war to aid in the tremendous amount of reconstruction work to be carried out in the belligerent countries. Some tool builders feel that this demand will all be

filled within the first 2 or 3 years of peace, while others think it may continue indefinitely. The size of these future export orders is also problematical, some of the machine tool people planning for large shipments, as compared with those who are not expecting much business of this sort.

Export business with countries not engaged in the war is going on steadily, although the present volume is not unusually large. A very favorable impression has been made by American machine tools in these countries and a considerable expansion of the foreign market is likely to result. Should this occur, and the domestic demand continue anywhere near its present volume, the machine tool manufacturers will have to expand their factory facilities considerably or new companies will have to be organized to supply the new market.

Divided as to Slump

There is a marked difference of opinion in regard to the likelihood of a slump in the machine tool market immediately following the end of the war. A number of the more conservative tool builders stated that they do expect a moderate slump for a short time when peace is made and consider that a general readjustment to more normal conditions must be made at that time. Prices will go down in practically every field, they judge, wages must be lower, commodity prices must decline in sympathy and, of course, since material and labor will be cheaper, machine tools must be lower in price, especially as competition will be very keen. It is worthy of remark, however, that each of these manufacturers made it plain that the quality of his products will not suffer in any way, either in workmanship or quality or material, due to the changing conditions. The makers do expect their export business to fall off, however, during the period of lower prices.

Contrary to the opinions of these men are those of others just as prominent in the industry who see no reason to anticipate a slump with the coming of peace. With orders booked a year ahead now and no indication of a falling off in the demand, but rather of an increase, if anything, these tool builders do not see any possibility of a slump. Prices of materials, wages, etc., may decline, but they consider that the market for machine tools will not suffer.

Tool Industry a Preparedness Asset

If the United States should become involved in a war all these machine tool makers would receive large government orders, which would take precedence over everything else in the plant in each case. A number of the factories would be taken over by the government for the manufacture of munitions, tools, etc., and these great works, with their perfect organization and trained workers would constitute a potent factor in the country's industrial equipment in time of war.

A Punctureproof Pneumatic Tire Wheel

Steel or Aluminum Rim Carries a Solid Rubber Tread and Shields Pneumatic Inner Tube in Newberger Device

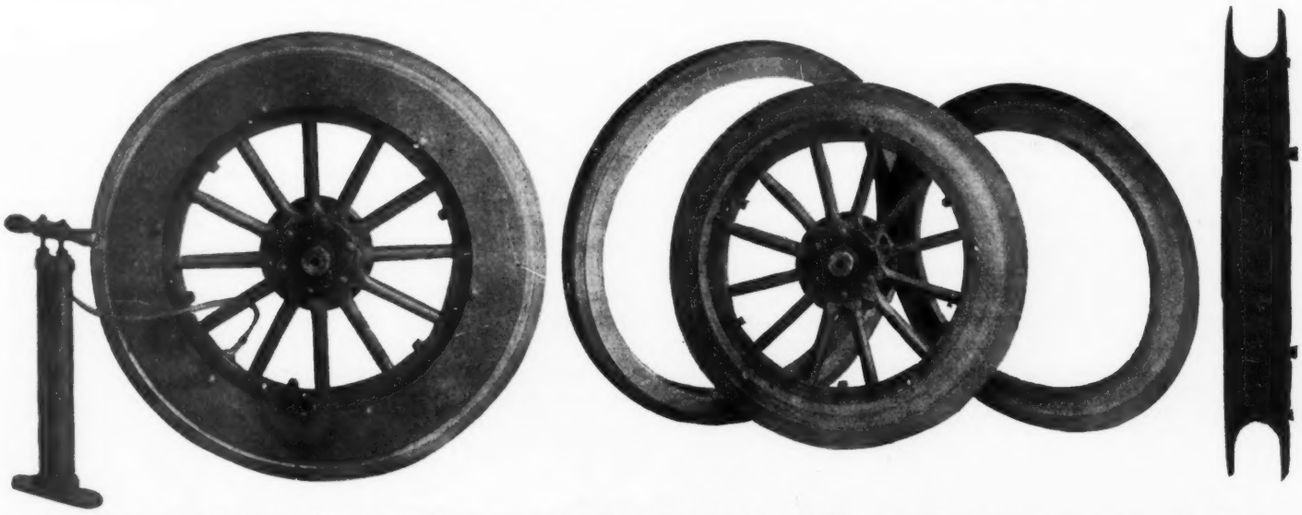
A PNEUMATIC tire wheel which does not use the ordinary flexible shoe has been tried out extensively by H. C. Newberger, 1161 Broadway, New York, the nature of the device being made clear in the accompanying illustration. The wheel, instead of the ordinary felloe band, is provided with a very deep channel which is semi-circular at the bottom with flat sides. On a rim which is inextensible and may be made of steel or aluminum, a solid tire is mounted and the metal part of this rim is also semi-circular on the inside section. Thus when the rim is in place between the flanges on the wheel there is a space left all around roughly circular in section. Within this space an ordinary air tube is placed, being lubricated with dry graphite. The rim is free to oscillate between the flanges on the wheel so that the resiliency of the air in the tube comes into play in very much the same way as with a pneumatic tire.

Tested for Several Thousand Miles

The device has been tried out on a Ford car and was submitted to THE AUTOMOBILE after several thousand miles of running. No wear seems to have taken place and the air tube was in perfect condition, showing no signs of fatigue at any point. In a short trial run over rough stone-paved streets it was made obvious that the action, so far as sensation is concerned, is practically identical with that of an ordinary pneumatic tire.

The air tube is, of course, quite unpuncturable, being en-

(*Continued on page* 487)



Newberger pneumatic tire wheel which employs a steel or aluminum rim, which, in combination with the deep channel illustrated at the right, houses an ordinary inner tube. This is inflated in the usual way, as shown at the left

272,954 Cars *and* Trucks *in* New England

47 Per Cent Gain in Registration During 1916—Over 32,000 Trucks

By James T. Sullivan

AUTOMOBILE and motor truck registration in New England increased 47 per cent during 1916. Reports from the registration officials of the six States comprising this important industrial section of the country showed a total registration on Jan. 1, 1917, of 272,954, of which 241,427 were registered as passenger cars and the remaining 31,527 as commercial vehicles. It must be noted, however, that the trucks in New Hampshire were included with the cars, no segregation being made by the registration officials. These statistics indicate an average of twenty-six persons per car throughout the New England States, basing the calculation on the U. S. Census Bureau's estimate of population in each State on Jan. 1, 1916.

87,591 New Registrations

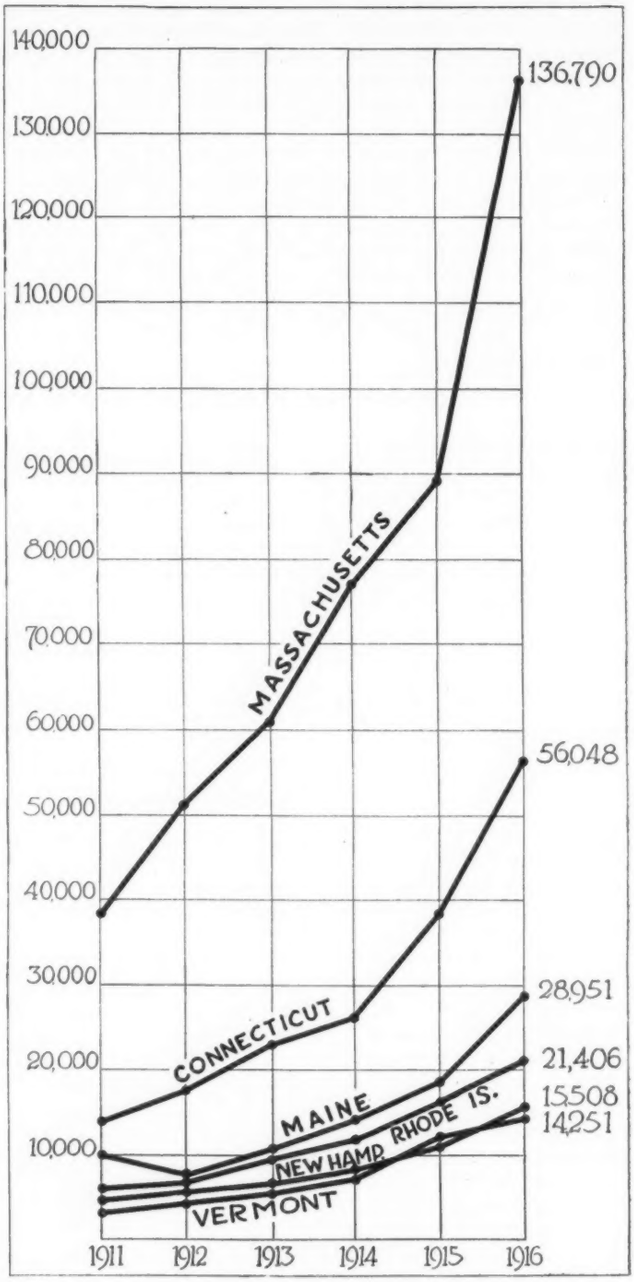
Registration in New England increased 87,591 during last year, 76,408 of the new vehicles being passenger cars, except for the 700 to 900 motor trucks registered in New Hampshire with the automobiles. Truck registration gained 11,733 in addition to the New Hampshire figures, which would bring the total increase to over 12,000.

One of the best-known men in the industry, after a conference with the Massachusetts Highway Commission, estimated that the cars and trucks registered in New England in 1916 represented over $200,000,000, of which Massachusetts registrations were responsible for a total valuation of over $100,000,000.

100 Per Cent Increase Possible

All these statistics of large registration growth indicate that this territory is being more intensively cultivated with each succeeding year. The great manufacturing and agricultural wealth of New England still makes it a good field for automobile sales, while the use of motor trucks is gaining rapidly, especially among the business men in the cities and towns and those farmers who are sufficiently up-to-date to realize the value of motor equipment in their work. It has been pointed out that the enormous influx of capital to some of the States from war contracts for uniforms and other textile produces, machine tools, rifles, ammunition, cannon and other manufactured products last year may have had much to do with the 47 per cent increase in car and truck registrations.

It must be realized, however, that much of this increased business in the form of export trade will continue and its profits should go far toward enabling New England to absorb at least as many automobiles and trucks as are now registered in that section. In 1915 the increase in car and truck registration was only 39,331, or 27 per cent, the total registration being only 185,363. Population to car ratio showed thirty-eight people to every motor vehicle, beside which figure this

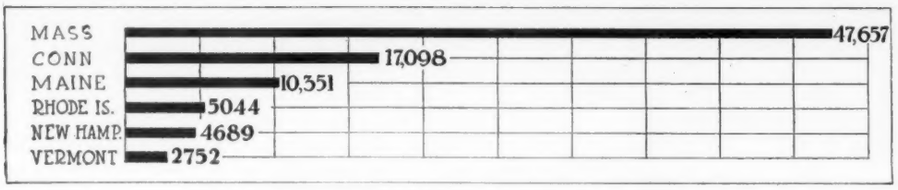


Registration in New England States since 1911

INCREASES IN REGISTRATION OF AUTOMOBILES AND TRUCKS AND IN FEES IN NEW ENGLAND IN 1916

State	Cars 1915	Cars 1916	Increase	Trucks 1915	Trucks 1916	Increase	Fees 1915	Fees 1916	Increase
Connecticut	34,103	48,289	14,186	4,847	7,759	2,912	$431,006	$624,767	$193,761
Maine	17,600	26,960	9,360	1,000	1,991	991	268,412	350,000	81,588
Massachusetts	77,173	118,596	41,423	11,960	18,194	6,234	1,205,420	1,564,353	358,933
*New Hampshire	10,269	15,508	5,239	550	....	....	282,277	348,408	66,131
Rhode Island	14,733	18,551	3,818	1,629	2,855	1,226	166,736	203,170	36,434
Vermont	11,141	13,523	2,382	358	728	370	218,789	297,992	79,203
Total	165,019	241,427	76,408	20,344	31,527	11,733	$2,572,640	$3,388,690	$816,050

*Trucks included with cars.



Increases in car and truck registration in 1916

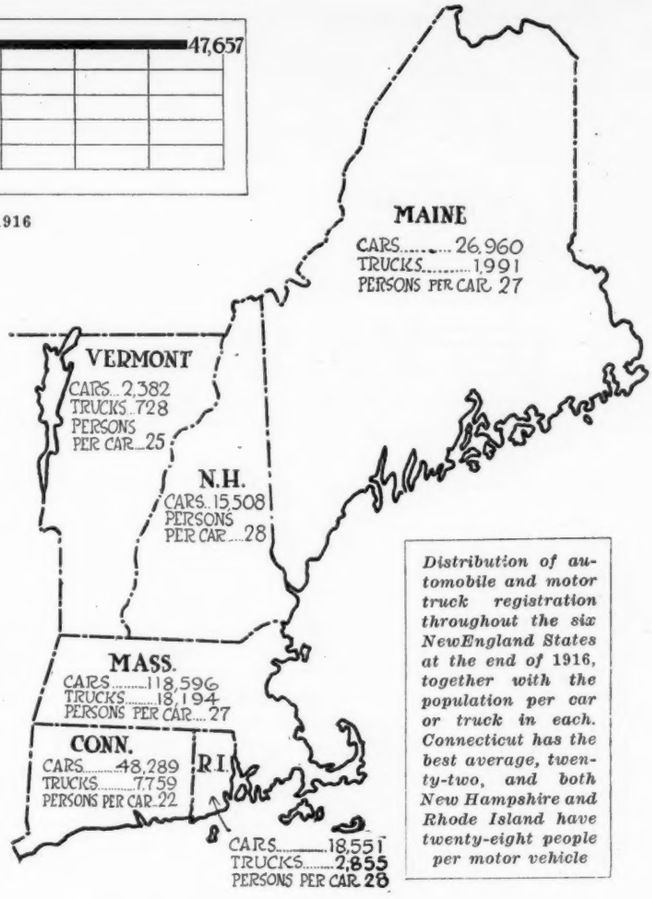
year's average of twenty-six people per car seems very small, but those who have studied the situation carefully feel that it is still far from its lowest point. At the end of 1915 there were only 2812 dealers, garages, repair shops and supply dealers in New England. At the beginning of 1917 these establishments numbered 3556, including 1908 dealers, 2032 garages and 1037 machine shops. These statistics, which were furnished by *The Automobile Trade Directory*, also show that the number of manufacturers of cars, trucks and engines in New England has remained practically unchanged, there being eleven car builders, twenty truck makers and two manufacturers listed.

Massachusetts Has Over Half

Of the 272,954 cars and trucks registered in New England last year, over 50 per cent were reported from Massachusetts, which registered 136,790 cars and trucks as compared with 136,164 machines for all the other five States combined. Of the 87,591 new registrations made during the year, Massachusetts has 47,657, or 53 per cent. The Bay State has twenty-seven people for each registration.

Connecticut ranks second with a total registration of 56,048, an increase of 17,098, or 44 per cent over 1915, giving it the best population-to-car ratio of all the group, there being twenty-two persons to each car or truck in the Nutmeg State.

Maine takes third place with 28,951 cars and trucks, an increase of 10,351, or 56 per cent over 1915. This is the largest increase on a percentage basis made by any of the six States. Maine has twenty-seven people for each car and truck registered.



Distribution of automobile and motor truck registration throughout the six NewEngland States at the end of 1916, *together with the population per car or truck in each. Connecticut has the best average, twenty-two, and both New Hampshire and Rhode Island have twenty-eight people per motor vehicle*

CAR, TRUCK AND ENGINE MANUFACTURERS IN NEW ENGLAND

State	Car Makers	Truck Builders	Engine Mfrs.	Total
Connecticut	4	3	2	9
Maine	—	1	—	1
Massachusetts	7	14	—	17
New Hampshire	—	1	—	1
Rhode Island	—	1	—	1
Total	11	20	2	29

DEALERS, GARAGES, MACHINE SHOPS AND SUPPLY HOUSES IN NEW ENGLAND

State	Dealers	Garages	Machine Shops	Cos. Having Supply Dept.	Supplies Exclusively	Total
Connecticut	394	431	211	50	70	713
Maine	279	262	124	80	19	456
Massachusetts	771	828	421	180	141	1,520
New Hampshire	192	214	107	59	10	319
Rhode Island	85	141	91	16	19	262
Vermont	187	156	83	33	11	286
Total	1,908	2,032	1,037	418	270	3,556

New England Registration

State	Cars	Trucks	Total
Connecticut	48,289	7,759	56,048
Maine	26,960	1,991	28,951
Massachusetts	118,596	18,194	136,790
*New Hampshire	15,508	.....	15,508
Rhode Island	18,551	2,855	21,406
Vermont	13,523	728	14,251
Total	241,427	31,527	272,954

*Included with cars.

Rhode Island, with 21,406 is fourth in rank, showing a gain of 5044 machines or 30 per cent over 1915. It has a population-to-car ratio of 28.

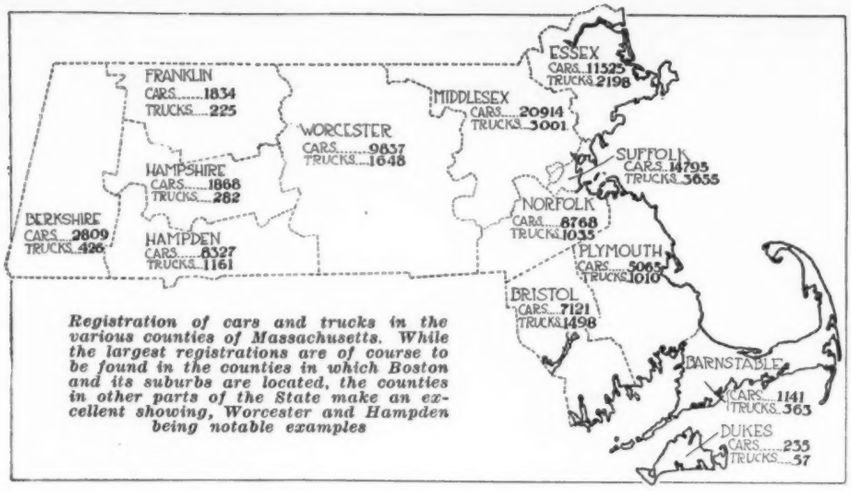
New Hampshire has 15,508 motor vehicles, an increase of 4689, or 43 per cent, over the previous year. Like Rhode Island it has twenty-eight persons to each car or truck registered.

Vermont, although making the smallest showing, has nearly as many cars as New Hampshire, registering 14,251 machines last year as compared with 11,499 in 1915. Its increase is 2752, or 24 per cent. While this may seem small compared with the gains made by other States it must be remembered that Vermont has only twenty-five persons for each car or truck registration, which is the smallest number boasted by any of the New England States with the exception of Connecticut.

Bay State Leads in Trucks

Massachusetts naturally shows the largest increase in truck registrations, having added 6234 commercial vehicles. Connecticut is second with an increase of 2912, while Rhode Island has 1226, Maine boasts 991 more trucks than it had in 1915 and Vermont enlarged its list by 370. New Hampshire trucks are estimated to number from 700 to 900 on Jan. 1, 1917, or showing an increase for the year 1916 of 150 to 350.

Last year the New England states received $3,388,690 from registrations. That was a gain of $816,050, the 1915 figures being $2,572,640. And of that total the increase for Massachusetts was $358,933 and that of the other five states $452,117, showing how the Bay State is a dominating factor in the automobile trade in that territory.



Registration of cars and trucks in the various counties of Massachusetts. While the largest registrations are of course to be found in the counties in which Boston and its suburbs are located, the counties in other parts of the State make an excellent showing, Worcester and Hampden being notable examples

When one looks back a few years and figures out that in 1909 there were only about 40,000 cars registered in all New England, or just a little more than are found in the Greater Boston zone to-day—the district within about 10 miles of the State house—it gives some idea of the growth of the industry. In all New England to-day the growth in these few years is practically seven times the total in 1909. And the fees for that year were less than $250,000, which compared to the total of last year is evidence of how the lawmakers have settled upon the automobile industry for revenue. While the cars were increasing about sixfold, the fees have jumped about fifteen times what they were in those days.

Figures showing the registration in cities and towns of Massachusetts for the first 10 months of 1916 give a very good idea of how the vehicles have been sold in the Bay State. There are thirteen counties in Massachusetts. In these counties there were registered during the 10 months 94,239 cars and 16,559 trucks. And of the thirteen counties the thickly settled eastern half of the State has some 72,144 machines, leaving the other few thousands in the section a little west of Worcester. That is not surprising, for the wealth and population are located in the eastern section.

Cities Have Most Registrations

There are thirty-six cities in Massachusetts. And naturally the greater number of cars are listed from those places. The figures are interesting. Of the 94,239 cars registered during the first 10 months of last year 57,484 were in the cities. That left 36,755 cars divided between the 200-odd towns in the state. Of the trucks there were 10,985 in the cities, leaving 5,574 in the towns. Boston led all the cities naturally with 13,541 automobiles and 3301 trucks. Springfield was next highest with 4777 cars. Worcester had third place with 3590 passenger cars, but it led Springfield in trucks, the latter having 679 and the former 682. Newton was in fourth place with 2727 automobiles. As it is more a residential than a business city, it had only 209 trucks, while at least eight other cities outranked it in commercial vehicles. Cambridge, for example, with 501 trucks was in fourth place,

POPULATION PER CAR IN THE NEW ENGLAND STATES

	Cars and Trucks Registered	Population Jan. 1, 1916	Pop. Per Car
Connecticut	56,048	1,234,031	22
Maine	28,951	770,064	27
Massachusetts	136,790	3,690,748	27
New Hampshire	15,508	441,545	28
Rhode Island	21,406	608,540	28
Vermont	14.251	363,075	25
Total	272,954	7,108,003	
Average population per car			26

1916 AND 1915 CAR AND TRUCK REGISTRATIONS IN NEW ENGLAND WITH INCREASES

State	1916	1915	Car Increase.	Per Cent Increase
Connecticut	56,048	38,950	17,098	44
Maine	28,951	18,600	10.351	56
Massachusetts	136,790	89,133	47,657	53
New Hampshire	15,508	10.819	4,689	43
Rhode Island	21,406	16,362	5,044	30
Vermont	14,251	11,499	2,752	24
Total	272,954	185,363	87,591	
Average per cent increase				47

CAR AND TRUCK REGISTRATIONS IN THE NEW ENGLAND STATES SINCE 1911 WITH DUPLICATES ELIMINATED

State	1911	1912	1913	1914	1915	1916	Gain In 6 Years
Connecticut	13,994	17,950	23,263	26,218	38,950	56,048	42,054
*Maine	10,045	7,743	10,570	14,300	18,600	28,951	18,906
Massachusetts	38,696	51,229	60,826	76,832	89,133	136,790	98,094
N. Hampshire	4,489	5,764	7,420	8,738	10,819	15,508	11,019
Rhode Island	6.017	7,565	9,894	12,331	16,362	21,406	15,389
Vermont	3,247	4,183	5,430	7,613	11,499	14,251	11,004
Total	76,488	94,434	117,403	146,032	185,363	272,954	196,466

*1911 registration includes duplicates.

STATISTICS OF REGISTRATIONS IN MASSACHUSETTS FOR 5 YEARS

Registered	1912	1913	1914	1915	1916
Cars	47,142	54,878	68,596	77,173	136,790
Trucks	4,087	5,948	8,236	11,960	18,914
Motorcycles	5,034	7,127	8,161	9,520	10,713
Mfrs. & deal.	1,114	1,330	1,518	1,742	1,977
Operators	14,693	17,009	21,257	35,623	45,975
Chauffeurs	5,570	5,233	5,601	9,033	10,928
Examinat's.	7,018	7,288	7,497	10,523	12,506
Fees	$645,454.64	$803,196.51	$965,669.55	$1,205,420.19	$1,564,353.81

NON-RESIDENT TOURISTS REGISTERED IN MASSACHUSETTS IN PAST 5 YEARS

State	1912	1913	1914	1915	1916
Alabama	2	0	2	2	0
Arizona	0	0	1	0	1
Arkansas	0	0	0	1	1
California	7	4	4	7	6
Colorado	2	0	1	1	0
Connecticut	43	43	30	55	37
Delaware	0	2	1	0	0
Florida	3	8	7	14	7
Georgia	1	2	7	15	5
Illinois	39	45	56	70	61
Indiana	3	7	9	13	6
Iowa	2	5	3	4	0
Kansas	1	9	4	2	1
Kentucky	4	9	4	12	5
Louisiana	4	3	6	8	3
Maine	3	6	16	13	12
Maryland	17	16	17	20	13
Michigan	15	13	18	19	15
Minnesota	2	4	4	3	3
Mississippi	0	0	1	0	1
Missouri	40	41	39	39	37
Montana	0	0	0	0	1
Nebraska	4	3	0	0	3
New Hampshire	12	10	41	59	44
New Jersey	56	80	64	109	114
New York	209	220	300	486	420
New Mexico	0	0	0	1	1
North Carolina	0	2	5	4	3
Ohio	40	29	21	39	33
Oklahoma	0	0	1	0	5
Penn.	78	80	81	131	108
Rhode Island	42	42	57	72	66
S. Carolina	0	2	0	2	1
S. Dakota	0	0	0	0	1
Tennessee	6	5	9	8	5
Texas	8	10	9	5	7
Vermont	2	4	4	15	13
Virginia	5	5	8	10	4
W. Virginia	0	1	0	3	0
Wisconsin	1	2	4	2	0
Dist. of Col.	12	23	33	51	42
Foreign					
France	0	0	0	0	1
Canada	2	3	7	9	5
Puerto Rico	2	4	3	2	2
England	0	1	1	1	0
Germany	0	0	1	0	0
Portugal	0	0	1	0	0
Cuba	1	1	3	2	1
Honolulu	1	0	0	0	0
Brazil	1	0	0	0	0
West Indies	0	0	0	1	0
Totals	670	744	883	1310	1094

while New Bedford, Lynn and Lowell outranked it in passenger cars. One reason for this is that many of the Boston truck dealers have service stations at Cambridge and so they have their machines registered from that city.

Boston the Great Center

Some idea of the way the cars are registered in and about Boston is suggested by registrations in the zone within 10 miles of the State House. Thousands of people work in the city, but live in the cities and towns adjoining Boston. So it is known as Greater Boston. There are some forty communities in this closely settled section and one finds 37,866 cars registered in the first 10 months of 1916. That is about one-third of the total State registration. In the same section there were 6571 trucks.

These figures are interesting because very nearly all of the places are closely identified with the Boston selling territory. In other words, the Boston men reach out into these places for their sales, and so of this total of cars pretty nearly 50 per cent of them are sold by the dealers in the Hub. A few years ago the Boston agent had all New England. Then the factories began to narrow down the territories. So the Boston men were limited to Massachusetts. Later on there were more divisions and the dealers found they had Eastern Massachusetts. When new companies began to come in they planned from the other angle and gave dealers Boston and a little surrounding territory only. As some of the Boston companies began to grow in importance they began to expand and they sought wider fields.

Now one finds some of the companies controlling Boston and Worcester. Others have those two cities and Springfield in a chain across the State. A few have Boston, Worcester and Providence. And a couple of more have Boston, Portland and Manchester. One dealer, Alvan T. Fuller, has Boston, Portland, Manchester, Worcester, Providence, New Bedford and Haverhill with his eye on other places. In this way some of the big concerns are beginning to absorb the smaller dealers in the larger cities. This movement has been very gradual, and with a couple of exceptions it did not begin until about 2 years ago.

There has been a change also in the routing of cars to New England. In the early days the cars all came to Boston and from there they were sent to the dealers in other sections. That time has gone by, although a lot of cars now come into Boston for distribution. But those for Maine very often come through Canada and are routed down to Portland and other cities from the North. Cars for New Hampshire and Vermont also follow a Northern route at times, or they strike off in that direction from Albany or Springfield. The cars for Connecticut swing down toward New York, and Rhode Island shipments route through Worcester. This means a lot of diverting of shipments to other parts of New

(*Continued on page* 470)

REGISTRATIONS IN MASSACHUSETTS CITIES FOR 10 MONTHS OF 1916

City	Cars	Trucks
Attleboro	660	107
Boston	13,541	3,301
Beverly	721	134
Brockton	1,834	334
Chicopee	708	86
Cambridge	2,004	501
Chelsea	306	118
Everett	682	89
Fall River	1,720	432
Fitchburg	885	166
Gloucester	524	184
Holyoke	1,232	239
Haverhill	1,653	267
Leominster	454	70
Lawrence	1,316	314
Lowell	2,024	400
Lynn	2,230	387
Marlboro	350	61
Medford	981	82
Malden	1,087	141
Melrose	620	55
Newburyport	273	41
Northampton	590	109
North Adams	370	74
New Bedford	2,155	401
Newton	2,727	209
Pittsfield	966	190
Quincy	1,103	191
Revere	467	77
Salem	850	198
Somerville	1,971	231
Springfield	4,777	679
Taunton	851	190
Worcester	3,590	682
Waltham	915	173
Woburn	366	72
Total	57,484	10,985

REGISTRATIONS WITHIN 10 MILES OF BOSTON STATE HOUSE

Suburb	Cars	Trucks
Arlington	664	81
Boston	13,541	3,301
Bedford	51	21
Belmont	367	22
Brookline	2,914	149
Braintree	350	46
Canton	208	34
Cambridge	2,004	501
Chelsea	306	118
Cohassett	154	38
Dedham	351	32
Everett	682	89
Holbrook	79	3
Hingham	272	56
Hull	99	40
Lincoln	85	17
Lexington	302	35
Milton	589	44
Melrose	620	55
Medford	981	82
Malden	1,087	141
Newton	2,727	209
Needham	309	39
North Reading	50	8
Norwood	395	70
Quincy	1,103	191
Reading	352	35
Revere	467	77
Randolph	137	25
Somerville	1,971	231
Stoneham	201	27
Waltham	915	173
Weston	223	18
Wellesly	382	48
Westwood	34	2
Watertown	586	93
Wakefield	356	44
Woburn	366	72
Winchester	654	57
Weymouth	451	88
Winthrop	481	159
Total	37,866	6,571

Massachusetts Registration by Make to Dec. 30, 1916

Ford	30871	Scripps-Booth	345	Selden	63	De Dion	21	Austin	9
Buick	8858	Mercer	288	Cartercar	62	Elec. Veh.	21	Hotchkiss	9
Overland	7898	Premier	265	Palmer-Singer	60	Herff. Brooks	21	Isotta	9
Cadillac	6348	Grant	261	Flanders	58	Monroe	21	Jordan	9
Studebaker	4629	King	247	Brush	53	Moyer	21	Linscott	9
Hudson	4375	Lenox	240	Henderson	47	Pilot	21	Cunningham	8
Maxwell	4035	Interstate	223	Moline	47	United States	21	Gen. Motor	8
Packard	3348	Lozier	223	Lexington	45	Courier	20	Henry	8
Dodge Bros.	3189	Fiat	206	Paterson	45	Detroit	20	B. C. K.	7
Chalmers	2868	R. C. H.	203	Marathon	43	Milburn	20	Buffalo	7
Reo	2417	Krit	174	Pathfinder	42	Vulcan	20	Enger	7
Metz	2313	Pullman	170	Atlas	40	Nash	19	Flint	7
Chevrolet	1794	Simplex	168	Berkshire	40	Owen	19	Gen. Veh.	7
Oakland	1723	Anderson	165	Briggs	39	Carnation	23	Mora	7
Pierce	1698	Apperson	160	L. P. C.	38	Acme	17	Carhartt	6
Hupp.	1412	Empire	151	McFarlan	38	Mercedes	17	Darracq	6
Oldsmobile	1352	American	150	Ohio	38	Partin	17	Itala	6
Jeffery	1298	Abbott	149	Bergdoll	37	Benz	16	Liberty	6
Stevens	1127	Briscoe	129	Crow	36	Cameron	16	Panhard	6
Chandler	1079	Everitt	128	Daimler	36	Columbus	16	Ross	6
Franklin	1022	Marion	128	Hollier	36	Cutting	16	Stearns	6
Paige	998	Thomas	124	Motocar	36	Parry	16	Whiting	6
Stearns	989	Auburn	120	Nyberg	36	Rolls-Royce	16	Bay State	5
Saxon	911	Columbia	119	S. G. V.	36	Standard	16	Chadwick	5
Peerless	798	Imperial	119	Herreshoff	34	Welch	16	Delaunay	5
Mitchell	790	Allen	118	Marquette	32	Lion	15	Great Western	5
Stanley	779	Bailey	116	Grout	31	Royal	15	Henderson	3
Winton	733	Baker	112	Corbin	28	Sampson	15	Henley Kimball	5
Pope	707	Little	109	Daniels	28	Bell	14	Imp	5
Jackson	690	Case	104	Woods	28	Easton	14	International	5
Regal	590	Warren	120	Clarke	27	Schacht	14	Lorraine	5
Cole	572	Trumbull	98	Elkhart	27	Havers	13	Pickard	5
Locomobile	630	Elmore	92	Lancia	26	Johnson	13	Pratt	5
Velie	532	Renault	90	Matheson	26	Republic	13	Rocket	5
E. M. F.	502	Michigan	81	Davis	25	United	13	S. P. A.	5
White	500	Moon	78	De Temble	25	Buckeye	12	Wayne	5
Haynes	471	Speedwell	77	Penn	24	Sears	12		
Kissel	450	Westcott	77	Garford	22	Argo	11	**Miscellaneous**	
National	441	Crawford	70	Lyons	22	Fostoria	11		
Stutz	434	Dort	67	Mutual	22	Knight	11	16 mfrs. each 4	64
Dayton	381	Rauch & Lang	67	Napier	22	McIntyre	11	17 mfrs. each 3	51
Knox	374	Autocar	65	Babcock	21	Detroiter	10	48 mfrs. each 2	96
Marmon	365	Waverley	65	Consolidated	21	American Cyclecar	9	171 mfrs. each 1	171

Pioneering in New England

THIS photograph of the first car made by Stanley Bros. was taken the first day the car was rolled out of the shop after completion and it was not run over 100 yd. when this photograph was made. It was in the spring of 1897. F. O. Stanley is on the left and his twin brother, F. E., on the right with his right hand on the throttle, the steering pillar being held in his left, which is under the robe. Work was started on this Stanley steamer in October, 1896, in the Stanley Dry Plate factory, Newton, Mass. This car was sold almost immediately after it was completed and Stanley Bros. at once decided to build two more like it. These two were sold and four more started in the Spring of 1898. Approximately twelve more Stanleys were built in 1898. In the fall of 1898 Stanley Bros. started to build 200 of these cars, which were alike in all respects and which perhaps stand as the earliest example of standardized manufacture in the automobile industry

By David Beecroft

BOSTON, MASS., March 1—New England is justly proud of the place she has filled, and is filling in the automobile industry. While the center of production has moved westward in accordance with the ideas of Horace Greeley, no one will ever be able to wrest from the six New England States the able pioneering work done within their confines within the last 80 years. We who have lived through the last 20 years and mingled day in and day out with the automobile industry, forgot the three-score years previous to that time, and if we would look at the inception of the automobile as a practical road vehicle in the United States, we have to turn the hands of the century clock back to 1835 and look into the local history of Brattleboro, Vt., that picturesque city nestled among the hills of the Connecticut River.

Here almost 82 years ago was built a practical steam vehicle which in most respects resembled a single-horse wagon, yet it had a good boiler and a two-cylinder engine, with cylinders approximately 3 in. in diameter. This pioneer American automobile, if not the first to be built on this side of the Atlantic, was constructed by a practical machinist whose name we have not been able to learn, but whose work is authenticated from various sources. The boiler was made of U-shaped tubes 1½ in. in diameter and so placed that the lower ends of these tubes served as a grate, while the flame followed them toward the top. Thus does Vermont establish its right to priority in the field of automobile pioneering, between the Atlantic and the Hudson.

It was nearly a quarter of a century later before any other definite pioneering work was accomplished, which brings us up to the days of the Civil War. We all delight in saying that "necessity is the mother of invention," but the present war leads us to almost re-word this axiom and write it that, "war is the mother of invention." The present war has worked wonders in motor transportation development and in more obscure circles it would seem that the Civil War had turned the attention of many inventive minds to some form of motor transportation.

About this time Sylvester Roper began his experiments with steam vehicles which continued until 1899 when he was killed on the Charles River track in Boston by a fall from a steam motorcycle which he was demonstrating on that track. While the developments in Brattlesboro, Vt., seemed to stand alone in the past, Roper furnishes the connecting link which brings the steam pioneering of the middle years of the nineteenth century up to the present date.

Roper's Vehicle of 1863

As far back as 1863 Roper had a four-wheeled steam vehicle which weighed less than 700 lb. and was capable of speeds as high as 20 m.p.h. At that time public sentiment was strong against automobiles, but notwithstanding this Roper's 2-hp. engine carried coal under the seat sufficient for a day's running and the estimated cost of fuel was 1 cent per mile. The engine could be operated on 20 lb. of steam.

While Roper was continuing his steam development for the next 30 years other New England pioneers flashed across the horizon of automobile invention. In 1864 another New England inventor, Spencer, constructed one or two carriages that were frequently seen on the public streets and highways.

W. W. Austin, of Lowell, Mass., in 1863 built a steam vehicle which he drove about the country for several years. It operated with 100 lb. steam pressure, used a horizontal boiler.

In 1876, H. S. Taylor of Derby Line, Vt., built a light weight vehicle, which was run on the roads for some time. The vehicle weighed not more than 500 lb., and its use was much restricted by the existing bad roads.

1885 Epoch Making in New England

The year 1885 proved an epoch-making one so far as steam was concerned in New England. One of the pioneers who came into the limelight in that year was James H. Bullard of Springfield, Mass., who from that date until his death a few years ago was constantly engaged in the development of steam. Mr. Bullard began work on his first steam vehicle in 1885, when he designed a cylindrical boiler with fire tubes placed lengthwise through it. The front axle was used for driving, and had the two-cylinder engine immediately in rear of it. The cylinders were 3 by 4½ in. with a clearance of 90 deg. With true inventive instinct Mr. Bullard soon took up the question of developing a flash boiler and it also is registered to his credit that he developed automatic control for a steam vehicle. The steam pressure regulated the amount of fire, shutting it off entirely when a certain maximum was reached. He used a pilot fire which was constantly lighted. He was one of the first to atomize fuel oil, using a small atomizer. This vehicle was successfully operated through the State of Massachusetts in the summer of 1886. The vehicle was so light that it could easily be lifted by two men.

The year 1885 brought onto the invention map the town of Lewiston, Me., where a steam vehicle was developed by one E. F. Fields, and an extract from the Lewiston *Journal* of Aug. 27, 1887, gives interesting sidelights on how the pioneers carried on their work. So strong was public sentiment against the automotive vehicle that the early hours of dawn were required for demonstration work, many inventors being afraid to take their vehicles on the streets or highways during the day, as much because of the ridicule they regularly expected as for the possible danger of damage suits due to runaways of horses. Here is how the Lewiston *Journal* told of the early morning trip of E. F. Fields, and Arthur Staples, author of the extract, deserves a place in automobile history for the work.

"E. F. Fields of Lewiston was the original dreamer who dreamt this thing. He and his partner, one Crawshaw, have built it at odd jobs. Two months ago a column of the *Journal* was devoted to a brief description of the anatomy and the physiology of this steam wagon with the secrets all deftly concealed by the charmingly ingenuous ignorance of the author. Since that publication, Mr. Fields has been deluged with correspondence from all over the world, asking for further details. The confidence with which some of them write to ask about when Mr. Fields will pass through their town in the steam wagon leads me to begin to question myself if perhaps I did not write a trifle too hopefully at that time. When the sessions of all the village schools of Maine begin to be appointed contingent on the appearance of the steam wagon, I begin to be afraid of the wondrous power of the press.

" 'Drop me a line when you are to pass through our town, and we will have the band out,' is the way one man writes. 'Our town will give the inventor a banquet if he can stop long enough en route,' writes another. 'How in thunder have you solved the question of *"inershy"*,' writes another. As well ask, where in thunder he got his supply of gravitation. 'Do you suppose you can climb Heifer Hill in our town,' writes another.

"Mr. Fields has letters from California and Chicago, and he has stopped answering them and has gone to work all the harder on his steam wagon. But, it is needless to say, Mr. Fields has joined in the dreams of his correspondents. Talk with him and you will see that he has pictured the bliss ecstatic of bowling over the country roads on his noiseless wagon, with legs crossed and elevated so that the summer breezes can blow up the basic periphery of the legs of the pantaloons, and his hat tipped back so that the inventor's brow can be kissed by the breezes that the eagle-like flight has engendered. It goes without saying that he has fancied dropping for instance into Turner, 10 miles, in 25 or 30 min. from the time he left Lewiston. It is hard to doubt that Mr. Fields has seen himself, in his mind, skipping in and out of the traffic along Washington Street in Boston, and dining with the Mayor of New York as a guest of the corporation.

"Why, on the morning of which these records speak, it was intended to take a run down to the 'rips' and back, a matter of several miles. It is true that owing to certain causes over which we have no control, our trip was modified into a far more modest spin, but if things had gone differently, we might have gone right on to San Francisco, and then what would the dear reader have thought. But with Mr. Fields all is happy. He is the most modest of inventors. He has a new this and a new that and with an invention for every difficulty, there seems to be no adequate reason why if the thing won't go on the road, it can't at least, fly through the clouds. But, and here is the beauty of this true tale of the morning, IT GOES!

Getting Ready

"The hour appointed was 5 sharp. The *Journal* was first on the spot, as you may assume. He hung on the fence rail and looked over into the gloomy waters of the canal that were flowing less than 10 in. deep in the black depths of the basin, but which were rising every minute from the tumbling rush beneath the gate house where the keeper of the gate had turned on the floods. A wait of 5 min. and the *Journal* scientist began to doubt the wisdom of his coming, when, up through the dimness came the form of a man. He jumped a puddle and stopped in front of Fields and Crawshaw's machine shop, and shouted into the air the single monosyllable, 'Frank!' There was no response. 'Frank!' again he shouted. 'Hello, there,' came back the telephonic reply from the heights above. 'Shall I start a fire?' 'Ye-e-s,' says Frank.

"The writer followed the newcomer, whose name afterward proved to be Peter, to the little shed and the doors were swung open as Peter proceeded to harness the prodigious

vehicle to steam. As indicated above, the vehicle has a prosaic exterior. It has none of the nobility that characterizes the iron horse of the rail, but it has a sort of get-there-just-the-same-look about it that is hypnotic in its attractiveness.

"The first business of the Apostle Peter was to punch it with a stick in its ribs. This seemed very appropriate, having an equine as well as mechanical suggestion. Again he punched it, sending up clouds of ashes that floated up through the abbreviated smokestack. Peter then drew a huge jackknife, and with a fe-fi-fo-fum air began to look bloodthirstily, as I thought, abroad. But he was only looking for a shingle or clap-board or some other dry thing to reduce to shavings. He whittled and he whittled shavings until he had a great pile of them in the boiler. Then he laid on pitch pine and dry pine and slab wood and shavings and edgings, and then he touched it off, and in less time than it takes to tell, there was smoke from the funnel and the sparks and cinders were rolling up in clouds of sooty smoke to the roof of the shed where a hole in the roof permitted its escape.

Getting Up Steam

"While Peter split the wood, the scientist crossed his legs and took a nap. When he awoke, Mr. Fields had arrived and it was 5 min. past 5 o'clock. The water was boiling in the boiler and had a domestic sound like the coffee pot on a morning over the campfire in the woods. There was a sizzling in the valves and smoke and flames poured out of the smokestack. 'All of that smoke and flames will be done away with,' said Mr. Fields, 'when we begin to use hard coal, and there will be no sizzling of steam when we have made our connections into the exhaust tank. She ain't quite finished yet.'

"Mr. Fields here approached the steam gage and, adjusting his black-rimmed eyeglasses, looked at the indicator. 'Ha!' exclaimed he excitedly, '50 lb. of steam in 10 min. Ain't she a wonder? Ever see the beat of that, Peter, for steaming? Go! Will she go? Well you just wait until we take a run up to Turner to see the folks.' 'Five minutes more and there will be almost enough to start with,' suggested Peter. 'Sure,' said Mr. Fields, 'in 5 min. we ought to have 200 lb., and we can get a move on with that.' Four minutes pass. The steam gage registers 150 lb. There is more violent sizzling and the indicator begins to bob and rattle. Two minutes have gone and the gage registers 200 lb. We are ready to start.

Starting with a Wood Fire

"Peter at this juncture took off his coat and prepared to put on the coal, but Mr. Fields stopped him, saying that it would take fully 15 min. longer if we waited for the coal to get going, and he was accordingly in favor of starting at once. 'I know the steam won't stay up with a wood fire, but we can't wait for coal,' said Mr. Fields. 'If we wait, the whole of Lisbon Street will be up and I don't want them to see us. If I had really known that you were coming, I'd have gotten up at half past 3 o'clock this morning and had a good coal fire going, and we'd have taken a run down to Lisbon and back before breakfast.'

"Peter backed out the wagon and headed it down the street and we all stepped out into the growing day to look the machine over. In all the world it looked like nothing else so much as a market wagon loaded with machinery. With the smoke and flames coming out of the chimney of the boiler, it looked also like a distillery on wheels. Just as we were ready to make a start with the 200 lb. of steam, Mr. Fields looked into the fire box and declared, 'Your fire is going out.' Peter split wood frantically and saved the fire, but it was a close rub, and the steam had gone down to 180 lb. Peter also broke his suspender in the operation. The *Journal* Scientific Expedition also woke up at this juncture and lent a hand assembling fuel and pushing on behind, and doing divers other things to divert his attention.

"All is now ready and the problem of rapid transit is to be solved perhaps better than any one can now judge. Mr. Fields steps into the middle of the road and says, 'There she is, and she ought to go. If she won't go, I don't want a cent. I tell you that the day is coming when the steam carriage is going over the ordinary country roads just as slick as a locomotive goes over the rails to-day, and pretty nearly as fast. But I want to say here and now that wet slabs ain't no sort of fuel to do it on. What it needs is first-class hard coal.'

"But Peter is in no mood for prophecy or philosophy. He wants to go. 'Right up here,' he cries to the *Journal* man. Peter is sitting on the driver's seat holding the steering gear, which is exactly like the brake to a railroad coach. Mr. Fields sits behind and runs the engine. 'All ready,' said Peter. 'All ready,' said Mr. Fields. 'All ready,' echoed the *Journal* man. Peter grabbed the brake. Mr. Fields turned on the steam and to the writer was left the proud privilege of pulling the knob that started the machinery and put into motion the first steam wagon that ever moved.

The Run to the Rips

"Friends—he pulled the knob, and lo! there was a tremor along the wagon from stem to 'starn'. Something seemed to kick that wagon right in the tailboard. An unseen power seemed to get into the back of the whole outfit and give it a bunt that shook it from cellar to garret. I never felt such a stir at both heart and bowels. It seemed as though the whole business was heaving in the deep sea. There was a mighty sizzle of steam. There was an awful leap forward, and before we knew anything about it, we were headed for a telegraph pole with every sign of shinning it and dropping down on the other side. I yelled, 'Stop her!' and Peter cried aloud as one in distress, and the man at the engine stopped her and backed out into the open way once again. Here we headed down the street again, and the first steam wagonist, Peter, hung to the car brake like a pullet to a worm. In less than 2 min. we were steaming down Canal Street like a red dog with a tin can at the end of his tail.

"Right here these chronicles might stop, for we have started and we are going down the street and that is all that it ever professed to do. Sluggards aroused by the noise, came to the windows and gazed at us. The corporation blocks seemed lined with white-robed figures. Early comers on the street seemed lost in open-mouthed wonder. Boys cheered, men waved their hats and the mill bells rang, although the latter may not have been on our account. It was a triumph.

"We went as far as the lower end of the Bates Block, over 500 yd., when the steam went down and the wet slabs turned dark green. We were left standing there with only 70 lb., and we couldn't navigate on 70 lb. But Peter arose beautifully to the occasion. Leaping from his seat he grabbed his jackknife and, rushing into the nearby woodyard, began to whittle shavings like a steam planer. At the expense of another suspender button, he again fired her up and with 180 on the gage we rolled asthmatically back to the Fields machine shop, the journey over.

"Then we did other things. We backed her and turned her. We went slowly backward down the street and we went up a little hill. In all, she acted beautifully. Everything worked perfectly, except the wet slabs. If it hadn't been for the wet slabs, we would have been in California by this time and looking for new towns farther west. As it was, the trip was a success.

"Some day a similar expedition will pass your high-bred trotter on the road."

Story of the Stanley Steamer

Field Machine Attracted Attention of Stanley Brothers—Solving Problems of Sufficient Steam and Automatic Control—First Car Built in 1897 After 10 Years' Development

IT was the work of the Field machine in Lewiston, Me., in 1887 that turned the attention of the Stanley brothers, F. E. and F. O., to the steam vehicle, and the inception of the Stanley car might be said to date from that period and to have originated in Lewiston. The Stanley brothers were living in Lewiston at that time and were much interested in the manufacture and testing of the Field machine. At that time they began to make plans and estimates in connection with steam cars.

It was just 13 years after the interesting trip of the Field machine when Francis E. Stanley drove a Stanley steamer over the 10-mile stretch between Lewiston and Turner, Me., in 30 min., an average of 20 m.p.h. Four passengers were carried. It required but this number of years to fulfill the prophecy made by Field with regard to the possibility of steam, undoubtedly a shorter period than Field himself had expected.

Solving the Steam Problem

After lengthy observations on the Field machine the Stanley brothers came to the conclusion that the only problem to be solved with regard to the steam automobile was that of generating sufficient steam to furnish the power for propelling the vehicle, and to have the steam generation automatically controlled so that the operator would be relieved entirely from the care of tending the fire. With this object in view the Stanleys set about in earnest in 1887 to design their first car.

Quoting from a letter from Francis E. Stanley on this subject, we find it required 10 years to accomplish this. Here is how he puts it:

"We did not succeed in getting a burner and boiler of extremely light weight and very great efficiency until 1897, and during the summer of 1897 we built the first Stanley steamer. After experimenting with several different types of boilers, we finally adopted the upright, fire-tube boiler, and the first cars which we built had a boiler of 14 in. diameter, with tubes 13 in. long. The tubes were ½ in. in diameter. The boiler was of the same type that we are using now. Instead of using a shell of sufficient thickness to withstand the pressure, we used a thin copper shell, and then reinforced that by winding it with wire the same as Maxim at that time was making cannon.

Boiler and Engine Types Unchanged

"The first engine was 2½ in. bore and 3½ in. stroke, two cylinders, double acting. The valve gear was the regular Stevenson link. That enabled us to reverse, and also to vary the cutoff so as to get more expansion.

"We have never changed either the type of boiler or the engine, the only variation being in sizes and some important detail. We adopted at once the anti-friction ball bearings on the engine and on all of the revolving bearings of the chassis.

"Now it may be interesting to you to know the progress that we have made since 1897.

"I ran one of those cars, equipped with a two-seated body for carrying four passengers, that weighed, fully equipped with water and fuel, without passengers, a little under 800 lb., and with four passengers I made the trip from Newton, Mass., to Lewiston, Me., in 1900 (before there were any State roads in Maine, and but very few in Massachusetts) at an average speed of 18 m.p.h. The gasoline consumption was 1 gal. to 7 miles.

"The same year F. O. Stanley ran one of those cars to the top of Mount Washington, carrying two passengers, demonstrating their hill-climbing ability.

"Yesterday (April 21, 1915), one of our cars was run a distance of 132 miles at an average speed of a little better than 34 m.p.h. and with a fuel consumption averaging 14 miles to the gallon of kerosene oil, which we are buying at 6 cents a gallon. This car weighs more than four times as much as the original Stanley steamer, for carrying four passengers. This trip was made without stopping for water, as we are using a condenser which condenses practically all of the water and returns it to the water tank, so that it is used over and over.

"With the first car I carried but 250 lb. pressure in the boiler, and without superheating the steam. In the last instance the boiler pressure was 600 lb. and the steam superheated to a temperature of 650 deg.

"As I look back and consider the work that we have done in our efforts to perfect the steam car, I realize that our first assumption was correct—namely, that there was but one real problem to solve, and that was, how to make a sufficient amount of steam, and how to have the steam generation automatically controlled so that the operator or chauffeur will be entirely relieved of any care in that connection.

Water Supply for 25 Miles

"The original steam car, the one in which I made the trip to Lewiston, consumed a gallon of water to the mile, and since my water tank contained but 25 gal., I could only run 25 miles without stopping to fill up with water. While we have quadrupled the weight of the car, we are using less water per mile than we used with our original car, and our 1915 model is equipped with a condenser which condenses all of the steam and returns it to the water tank. So that we are relieved of the necessity of stopping on the road for water, as the water will carry us as far as the fuel.

"The automobile industry has been very greatly aided by the inventions that have been made in pneumatic tires. Although the first car which we built for carrying two passengers weighed but 600 lb. it was very difficult back in 1897 and 1898 to obtain tires that were reliable. The single-tube tire was the first tire that was almost universally used at that time on bicycles, the tire known as the hose pipe tire.

Eight Tires in 50 Miles

"The first attempt that I ever made to run from Boston down to Portland, Me., I took four extra tires. I did not succeed in covering 50 miles before all of those tires were smashed or punctured. So that my trip terminated there. I made two other attempts in that year to make the trip down to Maine, but failed on account either of tires, or in one case my steering gear broke and the car was smashed up on the ledges by the roadside before reaching Kennebunk.

"So that I regard pneumatic tires as an indispensable requisite to successful automobile production, and with all

of the ingenious inventions that have been made, nothing yet has been found as a practical substitute for the pneumatic tire.

"We sold the first Stanley steamer in August, 1898, and it was the success of that car which led us to make plans for manufacturing them on a large scale, and before the close of the season, that is, before the last of December, we had booked orders for 100 Stanley steamers, and had commenced the building of that number. I think we can truthfully say that that hundred cars were the first lot of automobiles of that number that were constructed of standardized parts, and really represented a manufacturing business as distinct from making things by hand.

"Then, as you already know, in the spring of 1899 we sold our business to John Brisbane Walker, and he in turn sold a half interest to Amzi L. Barber, and the two companies, the Mobile and the Locomobile Co., were organized and commenced business. Mr. Walker subsequently sold the plant at Newton, where we were manufacturing cars, to Mr. Barber; and Mr. Walker built the factory up on the Hudson, in Irvington.

Begin Car Manufacture

"Subsequently we bought back the Newton plant, and in 1902 began again the manufacture of cars, having made several very important inventions, and from that time to the present time have continued the manufacture of the Stanley steamer."

At the time the Stanleys made their first cars, they were owners of the Stanley Dry Plate Co. They continued to be owners of this until they sold it out to the Eastman Kodak Co., in 1905. The original car was built in the works of the Stanley Dry Plate Co., Newton, Mass. A small machine shop was erected in the spring of 1898. When the business was sold to the Locomobile Co. a three-story factory building about 40 by 100 ft. was erected at Newton by that concern. In May, 1901, the Locomobile Co. having moved to Bridgeport, the Stanleys bought this building. They also bought one or two small buildings contiguous and built some others including a machine shop building of five stories about 150 by 80 ft. which was erected in 1905. The production of cars in 1901 numbered about 150. In 1902 the number reached 200 and gradually increased until about 1000 cars were produced in 1906. The production of Stanleys since that time has remained at about that figure.

Supply Sources Were Limited.

The sources of supply in those days were extremely limited. Practically everything that went into the original cars had to be made by the Stanleys themselves or in neighboring machine shops under their direction. The engine was made by the Mason Engine Works, Dorchester, Mass., from designs of the Stanleys. The differential, the axles, the boiler and burner, and all other parts, were similarly made. About the only thing supplied complete was the body, which was furnished by the Courier-Cameron Co., Amesbury, Mass. It is laughable to recall now that when shipped to Newton it was equipped with a whip socket.

272,954 Cars and Trucks in New England

(*Continued from page* 465)

England instead of coming into the Hub for distribution.

Some idea of the firms that are out after the business through their offices is found in the number of plates that the highway commission issues to dealers to place on their cars for demonstration and other purposes. Here is the list of the first ten as furnished by the commission:

Company	No. of Plates
Packard Motor Car Co.	120
Henshaw Motor Co. (Dodge Bros.)	75
Connell & McKone (Overland)	41
Cadillac	36
Henley-Kimball (Hudson)	34
Chandler Motors	33
Donovan Motor Co. (Studebaker)	30
Buick Motor Co.	30
Linscott Motor Co. (Reo)	25
Winton Co.	20

Another evidence of the rush of business in Massachusetts is found in the number of cars and trucks registered since Jan. 1, 1917, showing that Boston is an all-season city for vehicles. There were 58,470 cars and 15,608 trucks listed from Jan. 1 to Feb. 15. That was 21,756 more than were registered in the same period a year ago.

140 Manufacturers Represented

There are represented in Boston now very close to 100 different makes of cars and more than forty lines of trucks, and a surprising number have been added in the last year. A few years ago to look over the list of dealers each year it would be found that sometimes 20 or 25 per cent had dropped out in a season. Now the withdrawals are very few. In fact, if a dealer drops a line he takes on another. And there has not been the advance toward taking over agencies as branches as seemed to be the indication a couple of years ago. Another point worth consideration is the fact that a number of cars are handled by corporations where two or three men make up the firm, so that in reality the dealers in the Hub handling cars and trucks now may be set down at about 200. And they are making money. This year they will not be able to get all the cars they want, and so there will be a good demand for their used cars. Therefore, the men will finish the season in good shape financially. Figures for the past 5 years show the number of dealers in Massachusetts has increased nearly 80 per cent.

Show Means Sales Boom

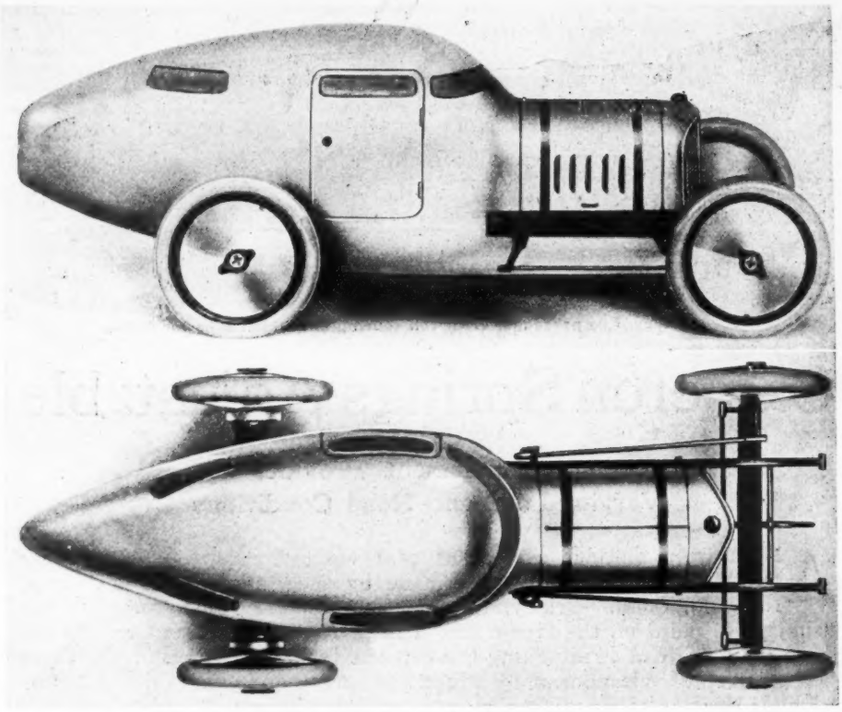
The show will give things a boom, and as there is plenty of money in this section the automobile dealers are bound to get their share. While there has been a falling off in the contracts for munitions, there has been abundant work to take the place of this, so that the people are not feeling any depression.

The one thing that some of the dealers are concerned about is the immense amount of money that has been taken out of New England the past year by promoters of stock schemes, among them some motor enterprises. The totals are said to have been in the millions, and it is argued by automobile dealers that prospective car buyers have been hit, and that possible sales have been lost. Some talk has been made about asking the National Automobile Chamber of Commerce to investigate the matter with a view of requesting newspapers that get a lot of automobile advertising to put up the bars to what seem illegitimate schemes. A few big newspapers have done so and thereby lessened the losses.

Interesting also in connection with the growth of motoring in New England are the figures for the past 5 years showing how non-residents have been coming to the Bay State year after year. The figures given in the last 5 years show that while there was a steady increase in 1912, 1913 and 1914 and then a big jump in 1915, there was a slight decline in 1916. This was due to New York and Pennsylvania not sending so many last year. These non-residents are those who registered their car so that they could stay for a period of more than 30 days. It shows that nearly every state has been represented some time, and a number of residents of foreign countries have come here with their own machines. These statistics appear herewith:

Racer with Closed Body Uses Aluminum Cylinders

Built by Miller Mfg. Co.—To Be Driven by Barney Oldfield



Racing car with closed aluminum body designed to approximate the perfect streamline

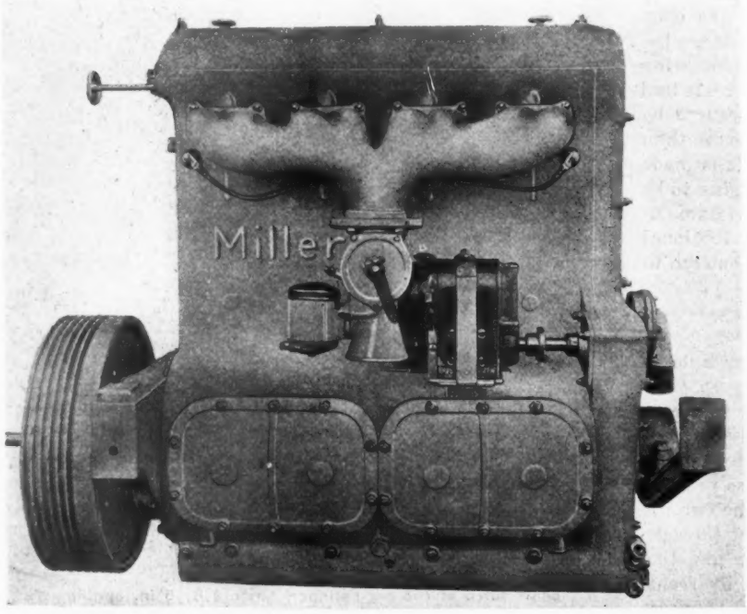
THE car illustrated on this page is the first of a series to be built by the H. A. Miller Mfg. Co., Los Angeles, Cal. It is stated to have the nearest possible approach to perfect streamline section at every point, giving less wind resistance than the conventional type of racing body. It is intended for track racing, and it is stated that Barney Oldfield will drive it this season.

The body is sheet aluminum, and particular attention is called to the way in which the curves of the hood and of the underpan have been blended into the body in such a way as to prevent changes in section which would defeat the streamline plan. The front, rear and side vision apertures are covered with wire netting but are not glazed.

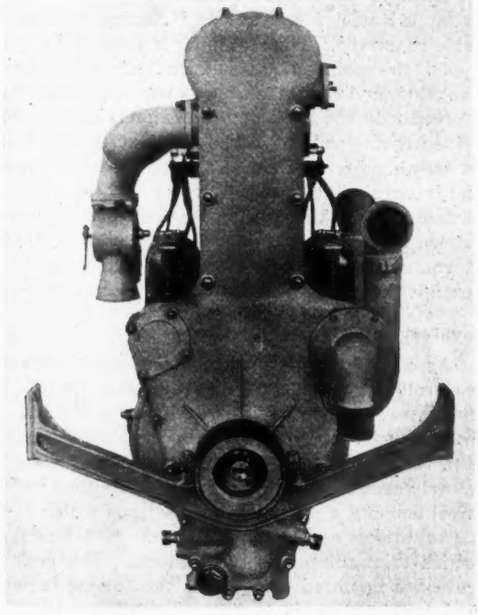
For power plant there is a Miller engine of 289 cu. in. piston displacement; an aluminum cylinder job claimed to give 135 hp. at 2950 r.p.m., which is 0.46 hp. per cu. in. A safety feature of the chassis is the provision of double steering arms on either end of the front axle

It will be extremely interesting to see how this car performs, because the idea that the fastest car for a given chassis would be one of perfect streamline form has long been held by engineers who had experienced the immense importance of streamline sections for aeroplane parts. Others claim that the theory is not upheld in practice with a body of so great a cross sectional area as this car.

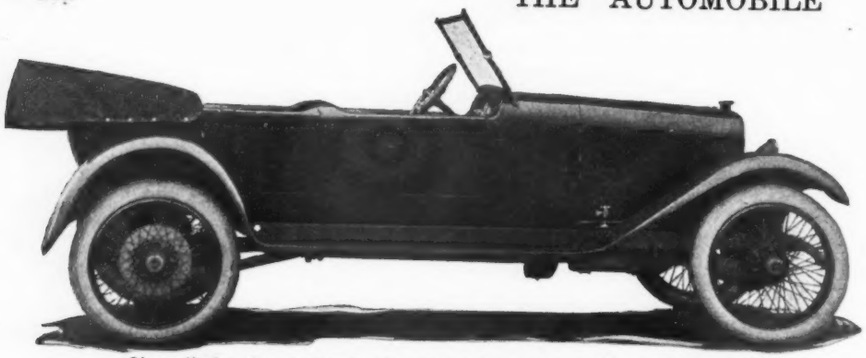
The Miller company is also building a twelve-cylinder car which will carry four magnetos on plates cast integral, and each cylinder will have a double spark from the two magnetos on its side. This engine has been used in De Lloyd Thompson's aeroplane. The cylinders are of very thin vanadium iron. The camshaft drives at both ends to obviate the twisting effect of the one-end driven shaft.



Miller aluminum-cylinder 289 cu. in. engine used in closed-body racing car



End view of the Miller engine



Six-cylinder, five-passenger Cameron touring car which sells for $1,250

Cameron Springs Adjustable

Simple Arrangement Provides for Varying Load and Road Conditions

AN entirely distinct system of rear springing is the outstanding feature of the Cameron six, made by the Cameron Motors Corp., Norwalk, Conn. Briefly, the rear springs are cantilever with the usual pivot point on the frame side a little back of the front end of the spring, but instead of attaching the extreme front end by a shackle, there is an adjustable attachment by which the spring end can be drawn up or lowered relative to the frame, so varying the strength to suit conditions of loading or road surface.

The detail of this construction is very simple. The clip which attaches the pivot rock joint to the spring also secures to it a forwardly-projecting short lever which reaches a little beyond the front end of the spring. Through this lever end passes a bolt that sets into a bracket on the frame, and adjusting the bolt alters the distance between the frame and the spring, causing the spring to move about its pivot point and so altering the distance between frame and axle. Movement of the axle is controlled by a robust torque tube construction, so that the rear ends of the springs can be attached quite loosely to the axle. Actually the end of the spring is hooked over into a sort of elongated eye, and fits easily over a pin, giving the requisite lateral rigidity with freedom of fore and aft oscillation to the extent required.

Has Stamped Front Axle

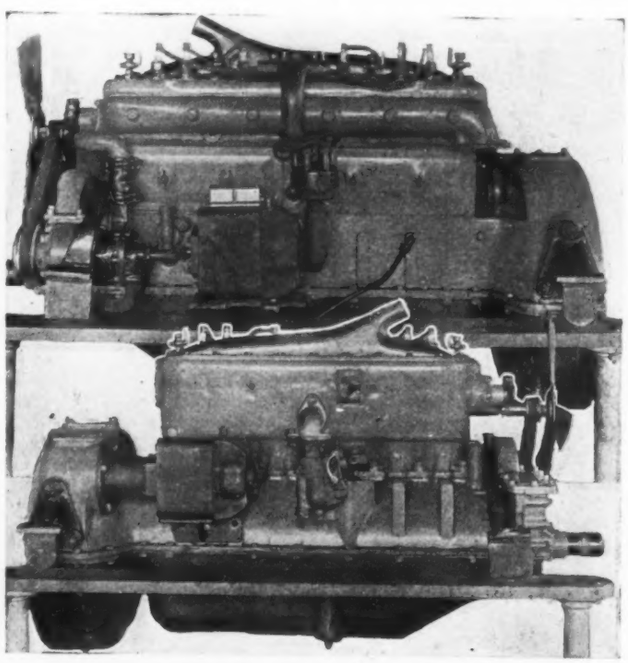
Another individual feature is the use of a pressed or stamped steel front axle, of channel section with the open side rearward. The stamping is extended a good distance beyond the point of attachment of the nickel-steel steering knuckle, and this extension is wrapped round the knuckle and forced into the back of the channel; being finally secured by riveting and welding. The nickel steel part is little more than a bushing for the knuckle pin, but by this method it is made an integral part of the stamping and there is no forging to be attached as has been the case with previous stamped axle designs. The spring tables do not exist in their conventional form, as the gage of metal in the stamping is stout enough to permit the spring to be attached direct.

Gearset Integral with Axle

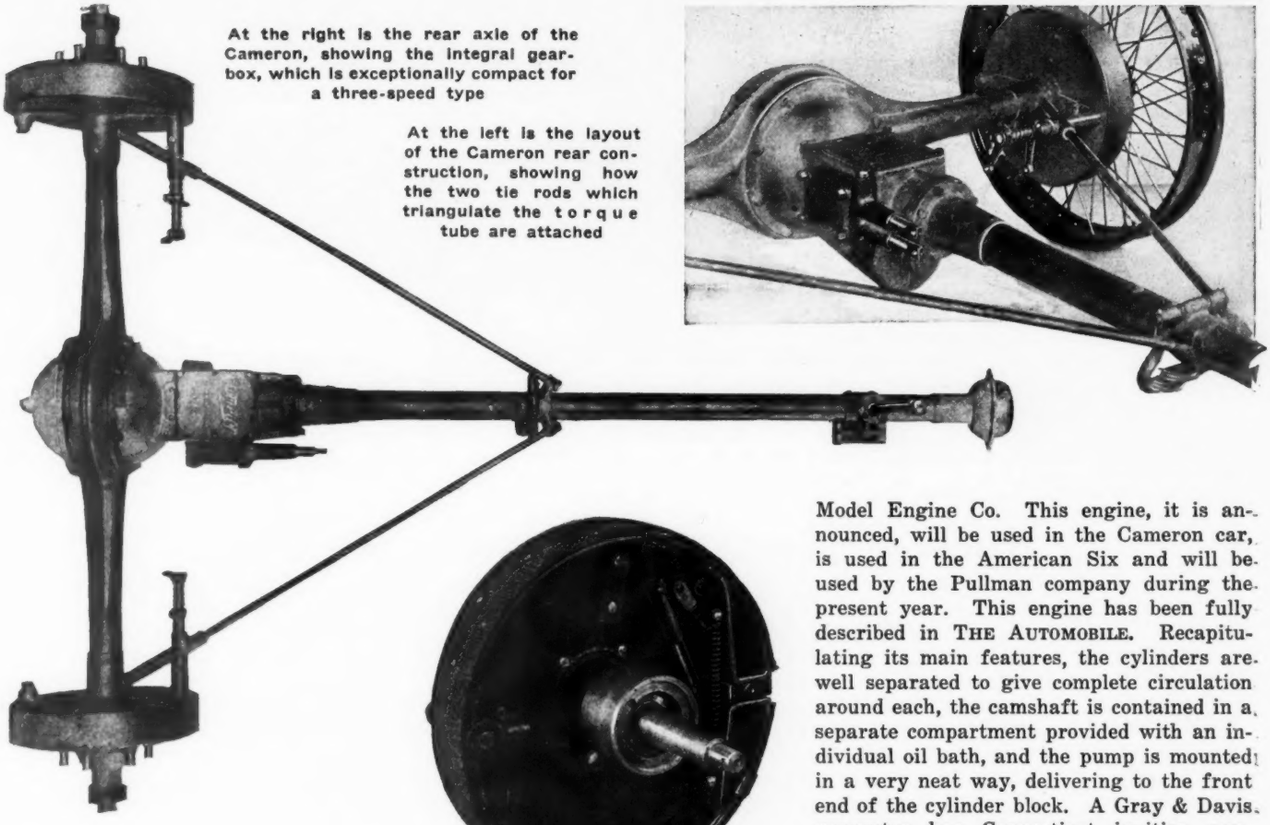
As already mentioned, the movement of the rear axle is controlled by a torque tube and this unit is made up very neatly. The axle itself is exclusively a Cameron design and has the gearset integral. The center casing is pressed steel and the end of the gearset carries the differential, as can be clearly seen in the illustrations. At either end of the pressed steel housing are substantial castings which carry the two internal brakes and also serve for the attachment of the tie-rods which triangulate the torque tube. The gear lever and the gate are mounted directly on the torque tube near its front end so that there is no possibility of any lost motion between

Cameron Features

No. of Cylinders	Six
Bore and Stroke in In.	3 by 5
Piston Displacement	212 cu. in.
Gear Ratio on Direct	4.00-1
Make of Engine	Amco
Cylinder Shape	L
Camshaft Drive	Helical
Water Circulation	Centrifugal
Lubrication	Splash Pressure
Type of Pump	Gear
Generator Make	Gray & Davis
Voltage	Six
Ignition System	Single
Ignition Make	Connecticut
Ignition Control	Hand
Make of Carbureter	Zenith
Fuel Feed	Carter System
Clutch Type	Dry Plate
Gearset Type	Selective
Gearset Location	Unit with Axle
Forward Speeds	Three
Final Drive	Spiral Bevel
Car Drives through	Torsion Tube
Rear Axle Type	¾ Floating
Make of Rear Axle	Own
Torque Taken by	Torsion Tube
Wheelbase	122 in.
Front Tires	32 x 4
Rear Tires	32 x 4
Wheels	Wire
Rear Springs	Cantilever
Make of Speedometer	Stewart
Crankshaft Bearings	Three, Plain
Gearset Bearings	Ball, Roller, Plain
Rear Axle Bearings	Ball
Front Wheel Bearings	Ball



Both sides of the six-cylinder Amco 3 by 5 in. engine used in the new Cameron



At the right is the rear axle of the Cameron, showing the integral gearbox, which is exceptionally compact for a three-speed type

At the left is the layout of the Cameron rear construction, showing how the two tie rods which triangulate the torque tube are attached

Double internal brakes with side by side bands as illustrated above are used on the Cameron

The front view of the car at the left illustrates the pressed or stamped steel front axle of channel section with the open side to the rear

the lever and the gearset. Of course, this mounting causes the lever to move slightly when the spring deflection is large but it is so near the front end of the tube that the movement is never enough to be disconcerting.

Both brakes are foot operated, the wider of the two bands being controlled by continuing pressure on the clutch pedal after the clutch has been withdrawn. The right pedal operates the narrower of the two sets of brake shoes and is provided with a ratchet permitting it to be left in the on position. Both brakes are 15 in. diameter, one being 1½ in. wide and the other 1¼.

Six-Cylinder Amco Engine

The power plant is a six-cylinder 3 by 5 Amco, now being made in a factory near South Norwalk, but strongly similar in design to the last engine produced by the Pittsburgh Model Engine Co. This engine, it is announced, will be used in the Cameron car, is used in the American Six and will be used by the Pullman company during the present year. This engine has been fully described in THE AUTOMOBILE. Recapitulating its main features, the cylinders are well separated to give complete circulation around each, the camshaft is contained in a separate compartment provided with an individual oil bath, and the pump is mounted in a very neat way, delivering to the front end of the cylinder block. A Gray & Davis generator has Connecticut ignition combined with it and there is the customary Gray & Davis starting motor with Bendix type of flywheel drive.

For the clutch the Borg & Beck single plate has been adopted, and this is inclosed in a sort of bell housing which carries the housing for the front end of the torque tube and incloses the universal joint. The carbureter is a 1-in. Zenith, and fuel feed is by the Carter system.

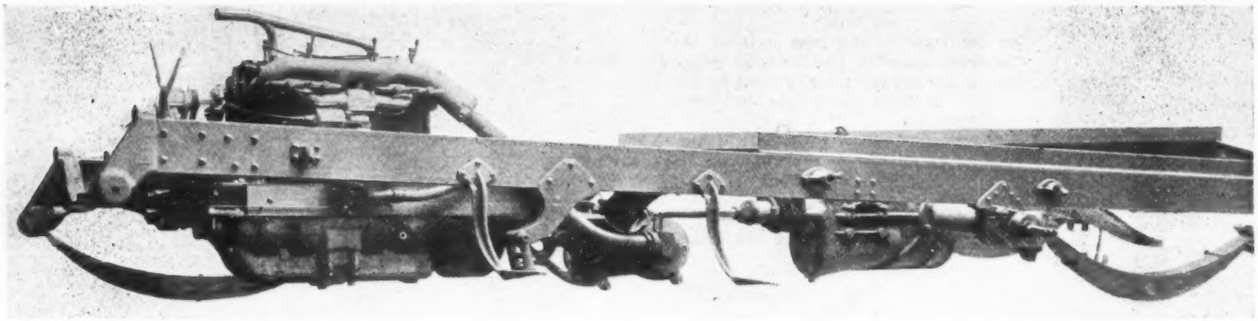
Care has been taken to keep the car low and it is actually somewhat lower than the illustration suggests, since the frame is much deeper than that shown and this allows the body sill to be reduced, bringing the floor closer to the frame top. A special detail of the body is an aluminum casting of arch formation which is attached inside the cowl. This holds the instrument board and also provides the lugs for the windshield, and it is stated that this gives great rigidity and eliminates weave in the front compartment.

Two body styles are made, the five-passenger and the roadster, both selling for $1,250. The upholstery is genuine leather on the cushions and the seat backs and all points where it is subject to wear. There is a choice of three colors, brown, maroon and cream, and a new kind of top material is used, a rich brown mohair. Five wire wheels are standard equipment, together with a Stewart speedometer and the usual small accessories.

An Unusual Windshield

The windshield is novel, having only a single glass pivoted at its center. It can be swung at any angle and the central position of the pivot allows it to be secured easily because air pressure acting equally on the upper and lower halves has no tendency to move the shield as a whole.

Plans are for an output of about 1000 cars during 1917 and it is stated that indications to date show this number will be absorbed mainly by Eastern dealers. The company intends to make a strong point of its service.



Illustrating the floating suspension of the power plant in United States trucks which provides such flexibility that all vital parts are protected from strains due to distortion or twisting of the main frame

Flexibility Features United States Trucks

Floating Suspension of Power Plant Insures Correct Alignment of Drive—Two Models Driven by Chain—Other Three by Worm—Capacities 4000 to 10,000 Lb.

UNITED STATES trucks are made in five models with capacities ranging from 4000 to 10,000 lb. They are featured particularly by the floating suspension of the power plant and by the adaptation of flexible rather than rigid construction. There are two chain-driven trucks of 2½ and 3½-ton capacity and three worm-driven models of 2½, 3½ and 5-ton capacity.

In the United States trucks the entire power system floats inside the chassis frame and regardless of the twisting and distortion, a perfect alignment of the propeller shaft is maintained This is secured by carrying the engine on a subframe mounted on the main frame in front at two points, where it is supported by coil springs. The rear end of the power plant is held by a ball-and-socket joint which permits free movement in any direction. The purpose of this flexible connection is to eliminate breakage of the crankcase supporting arm and to eliminate binding, due to variations in frame alignment caused by deep holes and ruts.

Constant Mesh Gearbox

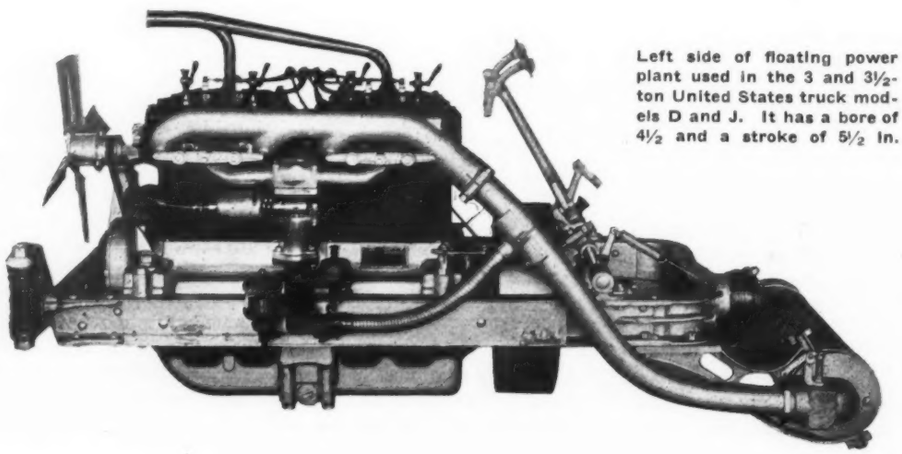
Other features of the United States line include a special type of gearbox in which the gears are always in mesh, and when running in high gear on the worm drive type, a solid shaft is given from the engine to the rear axle. This is accomplished by the use of dog clutches. Another unique feature is the building of the control and brake levers in unit with the seamless steel gasoline tank and the steel cradle on which it rests.

Regarding the actual construction of the truck parts, there are few radical departures from ordinary practice. The engine is built along conventional lines, being a four-cylinder, L-head type, lubricated by a combination of force feed and splash, with a Duplex magneto combined with dry cells for ignition and cooling by means of pump circulation, with a square, tubular core radiator, with horizontal tubes. This is carried in a steel cradle which is supported and cushioned upon coil springs, additional cushioning being secured by the use of a lining of anti-friction cotton webbing. This also prevents any part of the outer brass radiator shell from coming in contact with the metal supports which would be apt to wear through it. An automatic governor is used operating in connection with the throttle.

Engines of Different Sizes

One of the features of the United States trucks is that there is an engine of different size for each truck, so that the power supply may be strictly adjusted to the needs of the load. On the 2½-ton models, which are known as E and H, the engine is 4⅛ by 5¼, giving an S. A. E. rating of 27.2 hp., governed to attain a maximum speed of 1160 r.p.m. At 1500 r.p.m., 40 hp. is developed on the block. On the models D and H rated at 3½ tons, the engine is 4½ by 5½, giving an S. A. E. rating of 32.4 hp., with the speed governed at 1090 r.p.m. with the maximum speed at 1500, at which speed 47 hp. is developed. On the 5-ton model K the engine is 4¾ by 6¾, giving an S. A. E. rating of 36.1 hp. with maximum speed at 900 r.p.m. The engine will develop 52 hp. at 1500 r.p.m.

In the driveshaft between the engine and the gearbox there



Left side of floating power plant used in the 3 and 3½-ton United States truck models D and J. It has a bore of 4½ and a stroke of 5½ in.

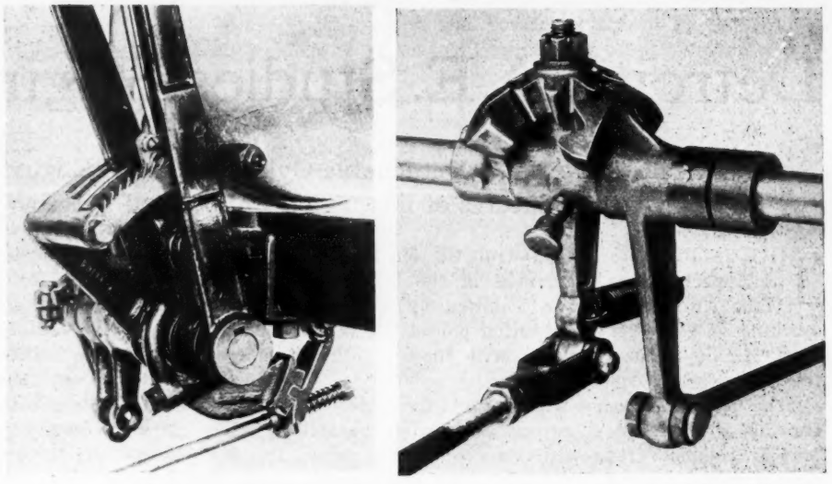
are two universals to take care of movement between the various units of the power transmission system The gearbox is located amidship and thus divides the propeller shaft into two lengths which are about equal. The gearbox is swung from two supports to the cross members of the frame.

Variations in Design

The entire line of the United States Motor Truck Co. is similar as far back as the gearbox. Beyond these the worm drive and the chain drive differ. Model E is the 2½-ton chain drive and Model H is the worm-drive truck with the same capacity. Model D is the 3½-ton chain drive, and Model J is the corresponding worm-drive truck. The Model K is the 5-ton truck, having worm drive. In the drive layouts on both systems neither radius nor torsion rods are used to transmit the propulsion. The drive is a Hotchkiss type with both torque and propulsion taken through the springs. The object of this is to reduce the unsprung weight and at the same time to relieve the clutch, transmission, universal joints and worm from shock and thus prolong the life of the parts. The material used in the springs which take the propulsion and torsional stresses as well as the suspension function is silico-manganese steel.

In the chain-drive trucks the differential is carried in the same case with the gearbox. Passing from it are the jackshafts with chain sprockets at the ends. The rear axle is a solid bar of heat-treated vanadium steel.

The entire rear system in these models is suspended from the frame at three points, on ball and socket joints, permitting great flexibility of movement when weaving of the frame occurs. Also with the chain driven rear axles in addition to the semi-elliptic springs there is a third spring hung crosswise of the frame and free at the ends. When the truck is running light the entire weight is carried on the semi-elliptic springs, which are light and flexible. They are just stiff enough to spring the empty or lightly loaded truck properly, protecting the mechanism from destructive jars which would occur should the light body be carried on the springs which are strong enough to suspend the fully loaded body. When the load is put on, the ends of the third spring come in contact with the others and it is brought into play, adding its strength and stiffness to theirs. Thus the spring suspension automatically provides the truck with a light, flexible spring equipment for running empty and heavier springs for greater loads.



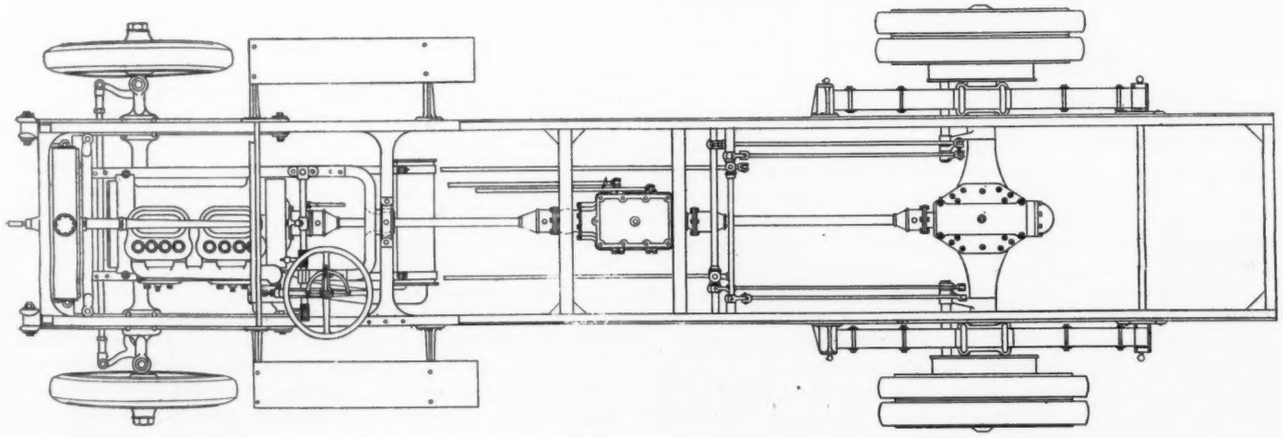
At the left is illustrated the gearshift safety lock which is a feature of United States trucks. At the right is the brake equalizer construction

One of the points which has been observed particularly in the entire line is to secure the most efficient traction. Eighty per cent of the load is carried over the rear axle, thus permitting the full power of the engine to be transmitted through the wheels, even under disadvantageous conditions.

The other specifications of the different models were in THE AUTOMOBILE for Nov. 2, 1916, on pages 766 and 767.

Hydraulic Hoist Dump Bodies

Various types of bodies are adaptable to the chassis, and a special point is made of the U. S. hydraulic hoist dump bodies which can be mounted on this chassis. These are for all kinds of bulk material, and are of steel with a hydraulic hoist dumping mechanism. They are recommended particularly for such materials as sand, gravel, stone, cinders, cement, brick, asphalt and coal. The load can be dumped by two or three quick movements of the driver's hand which starts the mechanism of the hydraulic hoist and trips the lever controlling the tail gate on the body. The body can be allowed to be returned to its normal position on the truck while the truck is on its way. On trucks for use in road work, this dump equipment is supplemented by a special catch for the tail gate, which allows it to open only a certain number of inches, when desired, and holds it firmly in that position. This permits of spreading material on the road while the truck is under way.



Plan view of worm-drive United States motor truck chassis, showing floating suspension of power plant and amidship gearbox

Detroit S.A.E. Studies Engineering Trends

Sixteen-Valve Four, Detachable Cylinder Heads, Engine Weight and Color Among Features of Discussion Following Paper by J. E. Schipper

THE reading before the Detroit Section S. A. E. of J. E. Schipper's paper, reprinted in the last two issues of THE AUTOMOBILE, was followed by a long discussion touching on some very interesting points. It was opened by C. C. Hinkley whose remarks, with those of other speakers, follow in slightly condensed form.

"The first item I want to take up is the sixteen-valve four. I do not think the expense connected with the sixteen-valve four is commensurate with its commercial value, for the simple reason that I think that the sixteen-valve four is nothing more or less than a T-head engine with all its attendant difficulties. The T-head engine is limited in its functioning for the simple reason that it has excessive pockets over the exhaust valve, which prohibit the use of the maximum pressure, such as we are using to-day; the reason for this being, as I have analyzed it, that the dead gas is forced over the exhaust valve pocket, and never gets away.

"The next thing is the twin exhaust valve. I cannot see any reason for it. We know by dynamometer test that the exhaust valve is not so important in its functioning as the inlet valve, but there is a reason for the twin inlet, because it has been determined that the exhaust can be considerably smaller than the inlet on a ratio of at least four to five. In connection with the twin inlet valve we have got to consider that the manifold is of sufficient capacity to take care of the capacity of the inlet valves. Now, when we increase the capacity of the inlet manifold we correspondingly decrease the gas velocity. When we decrease the gas velocity we take that part of the carbureting feature of the manifold away from it, to the extent that we get rapid condensation in the galleries and consequently loading under heavy pulling or in the low speed wide open throttle condition. There is only one other way to get around that. That is the application of excessive heat. Excessive heat, as we know, has a bad effect on the power output. The volumetric efficiency will drop as the heat goes up. If the volumetric efficiency falls off, due to the heat used to take care of the twin inlet valve, it comes back to the question of what is the value of the excessive valve capacity on the inlet side. Consequently the sixteen-valve motor to my mind dwindles down to the proposition where it is used for excessive high speed work, and I do not believe it is a proposition we can use commercially on cars where the maximum of performance is done under 30 m.p.h.

Detachable Cylinder Heads

"Detachable cylinder heads are increasingly prevalent in cars using small-bore power plants in either four or six cylinders. The difficulties of keeping the gasket tight have led to a re-designing of some of the engines that were shown with detachable heads a year ago. I believe the biggest trouble with detachable cylinder heads was where they did not have sufficient bolting and that valve distortion is due entirely to the locating of bolt bosses in the adjacent valve pockets.

"The question of counter-weights is covered on a crankshaft. There are two ways to get that result. One is to properly forge a crank and make it stiff enough to withstand distortion by brute strength, and the other way is to counterweight them. This is a big feature, and to my mind affects the main bearings. If the shaft is stiff enough it is not so important a feature.

"Some signs of the descending grades of fuel are noticeable on every car in the show. Hot air stoves are more elaborate than ever before, and in spite of the struggle for higher volumetric efficiencies the use of the heated intake manifold is growing rapidly.

"That is rather a confusing statement, if I may be permitted to say that. Mr. Schipper states that the use of the heated intake manifold is gradually growing. By that I understand he means the intake gallery, and not the pipe from the hot air stove to the carbureter. It is my firm belief that there are two places to heat your charge; one is in the intake gallery, and the other is before the air reaches the carbureter. More damage can be done by heating the pure air before reaching the carbureter than by heating the charge before it reaches the intake manifold, and the bulk of the heat must be obtained in the gallery, and not between the carbureter and the stove. All attachments between the carbureter and the stove should be so arranged that they can be disconnected during the warm months. The reason for this is that the charge of gas passing the carbureter, the lighter elements will always take to the center; that is, the pure air content; while the heavier elements will cling to the pipe, and by heating the intake gallery you apply the heat where it is most needed, that is, to the raw fuel, and not to the bulk of the charge.

Engines Too Light

"Generally speaking, engines are not lighter. I think this is a good indication. Most of our engines have been too light. It may surprise you to learn that the bulk of main bearing trouble is entirely due to crankcase distortion, and this is particularly so if you use aluminum cases. We have lately been experimenting with what we call the dry wringing of crankshafts, under high torque, with an electric motor, and it is an actual fact that it is impossible to put a bearing into a case under the dry wringing process that will stay put, unless the bearing is very securely ribbed. The work under which this is done is no more than what it is actually put to in service, and consequently I know a lot of designs where the main bearing is bound to distort after being in actual service, and will give trouble.

"The aluminum piston is all right if you handle it right. You have got to study the aluminum piston and get your workmanship proper. The clearances have got to be proper. We are machining aluminum pistons tapering 0.025, at the top land, 0.006 at the second land, and 0.004 at the bottom of the piston skirt. With aluminum you can carry higher compression and get higher thermal efficiency out of your engine. The center of the head does not get as hot as in the case of iron. We have recently been experimenting with two pistons of aluminum and of cast iron. We have run a 30-day breakdown test with wide open throttle, at 1700 r.p.m., 37 hp. With the cast iron piston job, the center of the head invariably failed and could not be kept in.

"I think with the high-speed engine, oil pressure has got to come. I do not believe that splash lubrication is adequate for high-speed motors built as we are building them to-day. We get too much agitation in the crank, and you cannot control the lubrication. The question of cooling is of course one that is optional. I will say this, that properly designed, both systems are very efficient.

"Speaking of comfort, the average distance from the clutch

pedal measured over the edge of the cushion to the seat back should lie between 37 and 38 in. on the average car. You can make it longer if you wish. If you make it short of 37 in. you will have what they call a slightly uncomfortable car. The shorter you get it the more uncomfortable it gets. The height of the seat does not enter into that; 13 or 14 in. falls within the limits of good practice. The height of the cushion from the floor can run from 13 to 15 in. The depth of the cushion can run from 16 to 18 in., 17 preferred. The distance from the under side of the wheel to the cushion can run between 7 and 8 in. The distance from the wheel to the seat back should be 13 to 15 in.; 15 is a little long, but you can get away with it. The width across the body at the point of the hip should not be under 42 in. and across the door; that is, along the front hinge, or where the door breaks, should be about 41 in.

"As for variety of color, I have had my fill of variety of color, and I want to say it is a bad proposition to go up against. It seems that people want color when color is scarce. That seems to be a human trait, and I want to say that you never get two lots of the same color alike.

"Regarding convertible cars, there is one thing I never could understand, why with the convertible we started out with, they began to take out the glass and the posts and left nothing but the roof. Now there is no more sense in taking out the posts, I believe, than there would be in putting five wheels on the car."

Chassis Lubrication

C. T. Myers: "There are two things to my mind which should be considered with more application than has been given them in the past by engineers. One is the question of chassis lubrication, mentioned in the paper as an important point. The committee has obtained for the next meeting a paper on chassis lubrication.

"The author of the paper to-night pointed out the fact of the vast number of cars that go into the hands of men who look after them themselves, or do not look after them themselves; and those small points are things on which we have got to concentrate, the things that make a fool-proof car. They are not necessarily expensive, although they may be at the start, but we must all apply ourselves to those small points in the car which make it fool-proof, and reliable, and do not take our very valuable time, because a car nowadays is not only a man's enjoyment and pleasure. It is an absolute necessity to almost all of us.

"There is the other point which is going to get a great deal more attention and that is the question of spring suspension, and I think we are going to see a lot of our old ideas exploded, on the question of spring suspension. I do not know whether all of you read the paper by N. W. Ackimoff, which is published now, but was only presented by title at the Winter meeting. There is a paper which will stand a considerable study, because the subject is so important."

C. F. Jefferies: "Speaking of the number of special color show jobs. We all know that practically every show job is dolled up in some special color. In fact I have known of a company to put all their show jobs in special colors, and they would not give the purchaser one for a $50 bonus."

Color Problem Is Serious

Mr. Stevens: "I think the color matter that Mr. Schipper referred to is really more a matter of factory practice and cost than it is an engineering matter, but the color matter is more serious probably than a great many of us realize. I have known of the time when a certain ingredient used in making red was so scarce that the entire market of the country afforded only 500 lb. and this was bid for by various color companies in the East and it shot the price up to a point where it was entirely out of proportion to the value.

"Another feature is, that in the modern system of baking which is very rapidly coming to the front on bodies as well as the metal or what was heretofore known as metal parts, the application of heat will change and alter to a great extent the shade of the color, and we have a Joseph's coat proposition all on one body, if they do not get a great amount of care all the way along the line.

"Another question is the fact that most of these bodies on the quantity production proposition are flushed or dipped with paint put on under pressure, a flooding process of various kinds, calling for a large amount of paint in the system. If the color should happen to change at the end of a season, there would be an immense loss in the paint on hand in the tanks. I really think the color matter, is more nearly a factory matter than it is an engineering matter."

Mr. Schipper Replies

J. Edward Schipper (in response): "In regard to Mr. Hinkley's discussion, I do not believe I can add very much. I did gloss over the sixteen-valve proposition, because I do not really believe that we can say very much about it as yet. It has not been commercially on the market long enough. There are certainly a few that believe very strongly in it, and I know there have been several experimental jobs tried out. I know of ten or twelve, anyway.

"Mr. Hinkley suggests the necessity for twin intakes rather than the twin exhaust. That almost suggests a twelve-valve engine with single exhausts and twin intakes. I do not know of anybody that has ever tried that out, but coming back to his mention of the manifold design, it is no doubt a compromise. You have got to compromise between the velocity in the intake manifold and the possibilities of volumetric efficiency with the pre-heated charge. We have all realized that the pre-heated charge must come, and naturally it is going to give us a dropping off in volumetric efficiency. That question like a good many others is a compromise.

"On the aluminum piston, Mr. Hinkley touched on the matter of workmanship, and that really seems to be the critical point in the whole situation.

"Pressure feed, as Mr. Hinkley said, is important, and no doubt it is going to increase. The splash system is inadequate, and also inaccurate. As a matter of interest, it might be well to consider the pressure that is exerted on the oil scoop as it cuts through the bath of oil, at each revolution at high speed. It is true that the oil pool does not get time to close. If you take an engine revolving at 2800 to 3000 revolutions, the pool of oil in the sump has not closed up by the time the scoop comes around on the next revolution. At the same time there is a considerable amount of pressure there and also a considerable amount of impact.

"Mr. Myers in his discussion mentioned the question of chassis lubrication. The question is one that has been somewhat neglected, and I can only say if the same attention were given to crankshaft lubrication as has been given to chassis lubrication, the bearings would not last 4 miles. The grease cups underneath the cars are neglected in 99½ per cent of the cars in use. I cite one case where I counted five grease cups underneath the car. There was a removable floorboard over the cups, but if you took the board out, you had to bend your arm around in the shape of a fish-hook to get at the grease cups.

"After the remark of Mr. Hinkley, to leave the posts remaining upright in the convertible body, I believe that it is not only the style, but it seems reasonable to do it. The great failure of the convertible type of body is the rattle that it develops, and the fewer movable parts you have in any body construction, the fewer rattles you are going to have. Not only that, if the posts were permanent, they could be made of smaller section than if they are removable because, like all removable parts, they are weaker if they are made in sections, they are weaker than they would be if they were permanent standards."

Goodyear Builds City for Its Workers

1500 Persons Comfortably Housed in 300 Homes—1000 More Homes Planned—Tire Company's Solution of a Big Present-Day Manufacturers' Problem—Making Goodyear Heights Attractive

By Allen Sinsheimer

EDITOR'S NOTE:—This is the second of a series of articles covering the efforts being made by our large automobile, truck and accessory makers to provide home and working conditions as nearly ideal as possible for their employees. Last week the promotion of health by the B. F. Goodrich Co. as the key to industrial improvement was reviewed.

IN an outlying section of Akron, closely connected with the plant of the Goodyear Tire & Rubber Co. is a plat known as Goodyear Heights. It has a population of about 1500 persons, and comprises more than 300 homes. In the near future it is planned to increase this number to 1300 homes. The plat and the homes form a part of the Goodyear company's method of providing ideal living conditions for its employees. The population consists of Goodyear workers and their families.

The present year will witness the erection of seventy-five to 100 homes. Parks and playgrounds are now perfected and swimming and bathing facilities are being arranged for at a sandy spot on the shore of Blue Pond, a natural and beautiful lake which adjoins the allotment tract.

The social life of the community is already vigorous. An association has been formed among the property owners and it is active in the promotion of civic improvements. A women's club, home and school league, boy scout organization and various young ladies' clubs are successfully working out the individual problems of the home, school and church.

Parks and Playgrounds Provided

To provide for parks and playgrounds, the company reserved attractive places in the plat and made them into parks, and a public square which may later be used for public buildings such as a library, hall or postoffice.

Since the Goodyear plan of home building was based on a wholesale system the cost of the homes has been naturally lower than that of the usual dwelling, and the cost of the first payment has been lowered accordingly. The average price paid for the property comprised in Goodyear Heights is slightly less than $300 per acre which forms the basis for the value placed on lots. When the space necessary for the laying out of streets, sidewalks, parks and playgrounds was provided it was found that only about four lots could be laid out to the acre which made the value of the individual lot $75, The construction of the necessary cuts and fills for the streets, sidewalks, curbs, gutters, sewers, railroad bridge, laying of water drains, pipes, etc., raised this amount to an average of about $500 per lot as per the following figures:

Cost of property	$30,000.00
Excavating 100,000 yd.	27,175.00
Curb for brick pavement, 11,796 ft.	3,538.00
Gravel roads, 36,078 sq. yd.	16,235.00
Sanitary sewer system	21,000.00
Storm water system	8,000.00
Main drain	8,510.74
Bridge (concrete)	9,729.66
Planting trees and shrubs	2,500.00
Office and engineering expense, architects, etc.,	21,000.00
Blue Pond drain	2,932.00
Instruments	445.00
Sidewalks, 265,531 ft.	23,153.00
Grading about houses, top soil and seeding	13,000.00
Miscellaneous (ditches, surveyors' monuments, etc.)	1,882.60
Curbs and gutters for gravel roads, 35,958 ft.	21,574.00
Total	$210,675.00
Total number of lots	430

The average lot is 50 ft. wide and 110 to 125 ft. deep, thus allowing sufficient space for those who want a home with land enough to give the house proper setting and at the same time the lowest cost of maintenance. This size allows an area at the rear of the house which can be used for a lawn or small garden. Since each lot varies in size and shape from the others a variety of houses are built to conform with each.

The dwellings designed and built have fireproof exteriors, are convenient in arrangement, comfortable and sanitary.

A street in Goodyear Heights. These homes were sold to employees at prices ranging from $1,800 to $2,500

Development plan of Goodyear Heights, showing arrangement of streets, park reservations and division into lots The black squares represent houses that have been built to date. Others are going up rapidly

There is a general architectural harmony but each house has a certain amount of individuality due to the wide range of architectural treatment of design, construction and materials. The problems of appearance and the arrangement of plumbing, hardware and finish were given considerable attention. All of the buildings vary in cost, the idea being to provide homes within the range of every purse.

Since some lots are more valuable because of location, view, etc., than the average and some are consequently less valuable than the average, the values were adjusted by adding to the average on the better lots and deducting from the average on the less desirable ones. By so doing the improved lots were set at figures ranging from $240 to $760.

It was found that by giving the work on a wholesale scale to the contractors, a large reduction in the cost of materials was secured, since the contractors were, in turn, enabled to make their purchases on a huge basis.

Property Sold at Cost

Goodyear seeks no profit on its investment in this enterprise and attempts to sell the property to the buyer at cost insofar as that cost can be estimated. The manner of paying for the homes is operated on a simple scale as shown in the accompanying tabulation.

Arrangements are made so that two mortgages may be placed upon a property. The first mortgage is for about one-

Manner in Which Employees Pay for Homes in Goodyear Heights

Cost	$1,984.00	$2,682.00	$2,288.00	$2,699.00	$2,801.00	$2,808.00	$2,845.00	$2,896.00	$2,998.00
Real estate value	2,480.00	3,352.00	2,860.00	3,373.75	3,501.25	3,510.00	3,556.25	3,620.00	3,747.50
Semi-monthly payments:									
First 5 years	11.27	15.25	13.01	15.34	15.92	15.97	16.16	16.54	17.06
Next 7 years	7.31	9.86	8.45	9.88	10.24	10.26	10.47	10.67	11.03
Last 3 years	3.86	5.19	4.44	5.22	5.43	5.43	5.53	5.22	5.75

Making total of 15 years.

Types of Homes in Goodyear Heights

VARIETY is one of the features in the design and construction of the more than 300 homes already built in Goodyear Heights, the city being developed by the Goodyear Tire & Rubber Co. for its workers. Property is sold to employees at cost insofar as the cost can be estimated. Lots and houses are provided to meet the incomes of all classes of workers in the Goodyear plant. A payment down is not required on this property.

One of the business corners in Goodyear Heights. All property is under restrictions and stores are erected under certain specifications in localities determined by the regulations of the community

half the value and is carried by a large life insurance company with whom details have been arranged so that the payments are made to the Goodyear company. The second mortgage is carried by the company and covers the balance of the purchase price.

No Payment Down Required

It is unnecessary for the purchaser to make any payment down when he buys the property. The semi-monthly payments are sufficient to pay off the second mortgage in 12 years and the first mortgage in 3 years more, the rate of interest being fixed at 6 per cent. These periods are the maximum time allowed for payment but provision is made to allow for extra payments, and the buyers may make a cash payment down if they so desire in addition to having the right to pay up the balance of payments due at any time. An amount is collected semi-monthly to provide for taxes as they become due.

To prevent speculation the company bases the semi-monthly payments for the first 5 years on the real estate value rather than on the cost value. The real estate value is 25 per cent higher than the cost and at the end of the 5 years if the worker is still in the employ of the company and retains his property and has made the payments as specified, the difference between the two values and the interest thereon, is canceled and credited to him and all the payments following are made on the basis of the cost price.

Company Carries Full Insurance

The company carries all of the fire and tornado insurance on the homes at its own expense for its own protection, during the period of payments. In addition, it arranged with a life insurance company for life insurance for groups of 100 employes each of whom had purchased Goodyear Heights property whereby the employee could, if he desired, secure life insurance on a diminishing scale which would insure his family against the loss of the home in the event of his death. The payments for the life insurance are made with the semi-monthly payments on the mortgages and range from 30 cents at the age of 21 for each $1,000 to 95 cents at the age of 55 for the same amount.

Some Restrictions Necessary

Certain restrictions were made by the company for the protection of the purchasers and the concern.

These prevented business concerns from opening stores in specified localities and stated that no sales of intoxicating liquors could be made on any portion of the plat.

They regulated the minimum cost of houses in accordance with their location.

They stipulated that every home must be constructed subject to the approval of the company's landscape and architectural advisers.

They determined the distance between the front walls and the streets, number of homes on a lot, prohibited the erection of fences nearer to the front line than 60 ft.

They stated that the barn or garage must be built of the same material as the house.

They granted rights, rights-of-way and easements such as the stringing of telephone and electric light wires, and the building of street car lines.

400 Acres in Plot

Goodyear Heights is located within the city limits and comprises 400 acres of which 100 acres are now developed. It is within a few minutes' walk from the Goodyear factories. The entire plat is composed of hills and valleys, making attractive home sites and allowing pleasant views. The general exposure of the property is to the southwest and southeast with protection from the cold north winds. Within the plat is the city reservoir inclosed in a small public park. Every effort has been made to save the natural beauty of the country and a plan worked out by a landscape architect has aided in retaining this important feature.

3200 Trees and Shrubs Planted

There were many trees on the ground before it was purchased and it has added to them by establishing its own nurseries in which more than 3200 trees and shrubs have been planted. All vacant lots in the plat have been seeded and carefully supervised.

The future was considered in the general plans and all sewerage and street widths were so arranged as to forestall later changes through the installation of any new city plans.

The streets are located to secure ample width for the traffic of the future and are as direct and convenient as possible, besides being supplied with the best modern types of sewers, storm drains, water and gas mains all of which form a part of the system of the city of Akron. Concrete walks have been laid in combination with concrete gutters and curbs, and the main thoroughfare has been paved with brick and the minor streets with gravel, the surface of which has been treated with a glutrin binder to obtain a hard-wearing coat and eliminate dust. Alleys have been avoided since they lessen space available for lots, add needlessly to the cost of maintenance and invite unsightly and disagreeable conditions, all of which Goodyear wishes to avoid.

Foreign Trade Department

Suggestions for Improvements in Packing, Marking and Forwarding Freight—Best Export Methods*

By L. V. Hummel
Traffic Manager, Gaston, Williams & Wigmore

THE subject of packing, marking and forwarding freight is such a large one that I will only touch on a few of the more salient features. A discussion on these subjects is also necessarily curtailed by the constantly changing conditions that are at present met in the shipping world.

Packing—In packing freight for export the importance of properly doing so is self-evident, and at present the American automobile manufacturer appreciates this, although in the past he did not, or, if he did, paid no attention to it.

There are some small matters which are still being overlooked. For instance, I have known claims made on cases arriving at foreign destinations for the goods contained therein being in a damaged condition or parts missing, but investigation developed that when the machinery was packed at the factory nuts were put on with a half-turn instead of being properly tightened. The railroad transportation, trucking through New York and handling on shipboard resulted in these loose nuts being shaken off and the bolts which they held dropping out. These bolts and nuts were overlooked when the goods reached destination; consequently a claim was presented.

Make Packages Smaller

There is one feature in regard to packing, other than properly doing it, which is not receiving the attention that it should, and that is the importance of reducing the size of the packages. Nearly every shipment of automobiles and parts pays ocean freight on measurement basis, and not by weight, and the slightest increase in the size of any box or crate means additional freight charges. A shipment of fifty automobiles recently handled that should have been so boxed that each automobile would measure 475 cu. ft., through an error in boxing, measured 5 ft. 1 in. in height instead of 5 ft. This seemingly slight error resulted in an increased freight payment of 10 tons on fifty automobiles, or $300.

Marking—I cannot too strongly impress the necessity of following to the letter the instructions in regard to markings on export orders. Conditions in foreign countries demand certain markings with which the parties placing the order are familiar and whose instructions are reflected in the wording of the order. Many may seem to be useless and unnecessary to us, but they are all required by someone and have their part to play. The marks on bills of lading, consular invoices, etc., must correspond with the marks on the package, and whenever a discrepancy occurs the shipment is held up until the error is rectified. Consignees are not only put to a great deal of trouble, but in some cases become liable to fines as a result of a variation in marks.

A case has come to notice where goods have remained on dock for several weeks before the discrepancies in marks on documents and packages could be straightened out. This not only resulted in goods not being paid for promptly, but placed the shippers in a bad light with their clients. With cable tolls at 50 to 75 cents a word in many cases, the cables necessary to straighten out the tangle involved is an expense that must not be lost sight of.

Many mistakes occur which seem to be inexcusable. A case came to my attention of a carload shipment of spare parts where the invoice and packing list were received from the factory and corresponded with the instructions on the order, but when the boxes were received it was found that the marks on the boxes were intended for another order. This, fortunately, was discovered before the goods were delivered to the pier; but it was necessary to re-mark in New York 250 cases, which resulted in missing the steamer for which the cases were originally intended. There is only one thing for the manufacturer to do, and that is for him to rigidly follow the instructions received with the order.

No Strict Routing Rules Possible

Forwarding—As mentioned, it is practically out of the question to-day to lay down any strict rules as to how shipments should be routed, with so many shipping restrictions, trade embargoes, etc., existing throughout the entire world.

For example: In order to make a shipment to Russia it is necessary for the consignee to secure permit from the Russian officials in Russia for the goods to enter the country. In applying for this permit it is necessary to give a complete history of the article and the use for which it is intended. If the explanation is satisfactory the Russian officials issue a permit and their representative in New York is notified by cable.

Practically the same principle, with some slight modifications, holds good for England and for certain commodities in France. Trucks can only be shipped to France when they weigh 5500 lb. or over. This means that a certain class of trucks must be equipped with bodies in order to bring them up to the weight standard necessary for them to enter France.

Regulations Change Frequently

The regulations covering the issuing of permits and the instructions as to marking packages change from day to day, and for this reason it seems desirable for the manufacturer to handle his export business through a forwarding agency or some similar concern fully equipped to look after such matters. The forwarding agent acts as the direct representative of the manufacturer; he is on the ground, is fully posted as to changes and regulations as they are made, and is in position to take advantage of any changes or fluctuations in ocean rates, such as may be afforded by a steamer being short of cargo and offering its remaining space at less than the current market rates. It is the business of the forwarding agent to watch for just such a case and give his client the advantage of it. He is also conversant with the requirements of every country and can furnish all documents, such as ocean bills of lading, consular invoices, export declarations, etc.

It would be necessary for a manufacturer located at some

*This is a digest of the paper read by Mr. Hummel at the convention of automobile export men recently conducted by the National Automobile Chamber of Commerce.

inland point to conduct negotiations, if he did not have a forwarding agent, either by mail or telegraph, or else maintain a representative of his traffic department at shipping point. Even though he decided on the latter, his shipments do not always pass out by the same port, and the forwarding agent who has his representative at all ports of consequence is better prepared to handle the shipments of his clients through all ports with better satisfaction than the manufacturer could.

Routes.—I am afraid that it is impossible to give any definite information as to the most advantageous routes, for the simple reason that what may be the best to-day would not be to-morrow, or might be entirely discontinued the next day. A steamship line sailing, for instance, under a belligerent flag may be forced to suspend its sailings at any time, due to the government requisitioning the vessel or vessels. Shipping at the present time is an hour-to-hour proposition.

Recently a permit was obtained for a shipment of 200 automobiles for Russia, but when it came time to ship it was found they could only be accepted via the west coast, via certain railroads and via a certain ship. Elaborate plans had been made for forwarding via other routes but by an overnight decision these plans were upset and others had to be made; and it was necessary to forward some of these automobiles from the East, paying a railroad rate of $2.25 per 100 lb. as against a 48-cent rate to New York, and all this notwithstanding the fact that there were boats loading at New York.

This case is cited in order to show how conditions change overnight, and in this connection I desire to impress upon you again the importance of the manufacturer doing his part by seeing that the packing, boxing and marking are properly done so that when permits for ocean space are received the shipment is not further delayed due to the necessity of recoopering, changing marks or discrepancies in measurement. In other words, a manufacturer before a shipment goes forward should be absolutely certain that he has followed all instructions received with the order.

Universal Reboring Tool Weighs Only 60 Lb.

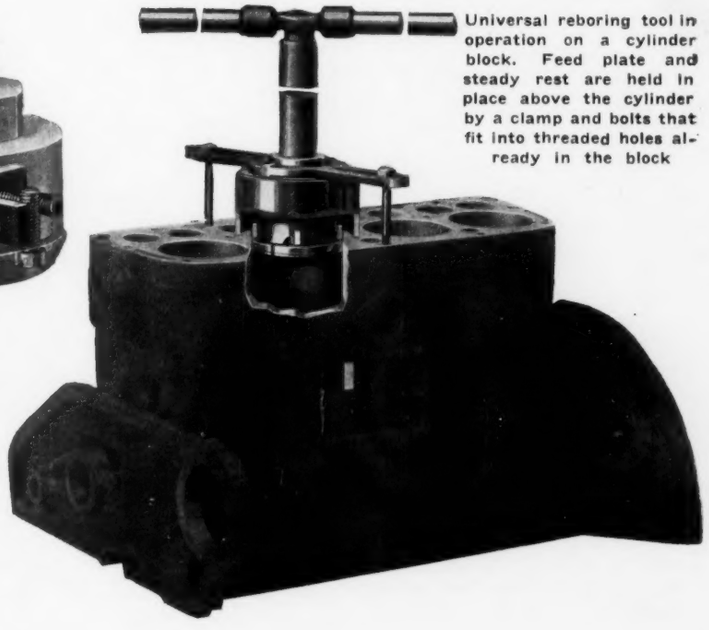
New Device Will Bore a Cylinder Completely and Is Claimed To Produce Work Within 0.001 In. of Roundness

THE Universal Tool Co., Detroit, has brought out a cylinder reboring tool which weighs complete but 60 lb. The tool will rebore a cylinder from start to finish and is claimed to give a perfectly round section as near as is possible in commercial practice. The finished job is claimed to be within 0.001 in. of roundness, and the tool is capable of taking as much as 1/16 in. oversize in one operation.

In using the tool a beveled expansion ring is slipped into the cylinder to be rebored. A pilot head fits into the bevel of the ring, and as the latter under the pressure of the feed bar and the pressure head works its way down the cylinder, the pilot head centers the cutting head. There are four cutting surfaces on the head, all adjusted by a single operation. A feed plate and steady rest are locked securely in place above the cylinder by means of a clamp and bolts that fit into the threads or holes already in the cylinder block. A double-ended wrench fitted to the top of the feed bar which is threaded and operated through the feed plate, serves to propel the cutter head down through the cylinder.

The prices of the device vary in range according to the size. For Ford, Dodge and Maxwell cars, the price is $80, the next size is $100 and a size having a range of from 2½ in. to 5 1/16 in. is $150.

Universal cylinder reboring tool in phantom, showing general design and construction. There are four cutting surfaces on the head, all adjusted by a single operation



Universal reboring tool in operation on a cylinder block. Feed plate and steady rest are held in place above the cylinder by a clamp and bolts that fit into threaded holes already in the block

Road from Atimonan to Gumaca, the beginning of a future highway to connect the fine road system of southern Luzon with Manila and the extensive roads to the North

Philippine Islands Are Fertile Field

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Part II

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Next 10 Years Hold Wealth of Business for U. S. A. Car and Truck Manufacturers—90% of Sales on Time Payments

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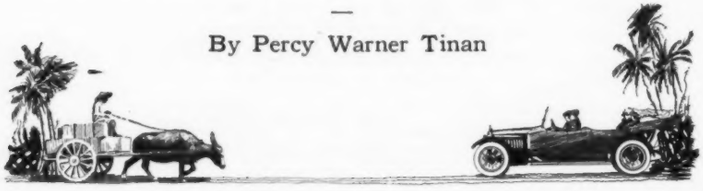
By Percy Warner Tinan



EDITOR'S NOTE:—This is the second installment of a special serial article on the Philippine Islands as an export field for the U. S. A. manufacturer. The author, Percy Warner Tinan, has been connected with the automobile industry in the islands for 6 years, first with the Manila Times and Philippine Free Press, then 3 years as sales and advertising manager of the largest automobile house in the Far East; and as owner and publisher of Philippine Motor Topics, road guides and directories.

IT should always be remembered that the Philippine Islands are the richest undeveloped tropical territory in the world to-day, that their resources have barely been tapped, and that while motor vehicle sales may be slow, the next 10 years hold a wealth of business for both trucks and passenger cars. John Barrett, former minister to Siam and recently head of the International Bureau of American Republics, says that, "even Java, Garden of the East, with its trade of $250,000,000, has no such large extent of fertile area as the Philippines." There are, for one thing, 40,000 square miles of virgin forests of the finest hard woods in the world and there are hundreds of thousands of acres of untouched coffee, sugar, rice and hemp land. And best of all, good road building goes on apace. Automobile manufacturers have one thing to consider only, and that is that the democratic party, although recently more or less erratic on matters Philippine, will finally come to its senses sufficiently to realize that an American protectorate in these islands is an absolute necessity.

The total foreign trade of the Philippines in the fiscal year 1915 was about $116,000,000. In 1909, before the free trade bill was passed, it was only $58,000,000. In 1909 the total exports to the U. S. A. were $10,000,000; in 1913 $20,000,000. The imports from the U. S. A. in these years were $5,500,000 and $25,500,000 respectively. In 1913 the rice imports amounted to $7,000,000, the shortage of home grown rice being due to a lack of carabaos for cultivation, thousands of them being used for hauling that is eventually to be done by trucks.

The Philippines produce for shipment annually about 144,000 metric tons of hemp, 113,000 tons of copra and 212,000 tons of sugar, most of which will sooner or later be hauled to shipping centers on trucks. The port of Cebu alone in 1913 shipped 64,000 tons of hemp and copra. There were eight trucks in Cebu in 1915, and most of these were government property. Seventy-five per cent of these products could be hauled to market on motor trucks over macadam roads.

The islands produce 52,000,000 bushels of rice, the great bulk of which is grown in two provinces north of Manila. Not over four trucks are engaged in rice transportation. Two carabaos are used to haul a ton of rice over distances from 10 to 30 kilometers. They take 3 days for the round trip and then rest for a day or two. This can all be done by motor trucks on good roads as soon as three or four large bridges are built.

There are several details in connection with cars suitable for Philippine trade of which the manufacturer should take note, although as a whole buyers are not so critical as in some other foreign territory. First of all, a magneto is almost a necessity if a car is to have a successful sale. Some manufacturers have seen fit to disregard this request from Manila dealers on the ground that their ignition was all right, best that could be had, etc., and that a magneto was superfluous, or that it could be supplied only at extra cost. The systems used by these builders are no doubt perfect in the hands of intelligent owners, the great majority of whom drive their own cars, but they are a source of trouble when shipped to the far corners of the Philippines where a battery-charging plant is often unavailable and the cars are in the hands of incompetent chauffeurs or owners. For his own good every manufacturer sending cars to the Philippines should see that they are magneto equipped. The writer has known of many instances where the dealer in the islands was forced to equip cars with magnetos before they could be sold. Standard tread is the only tread used in the islands.

Left hand drive, while not a hindrance to sales, should be supplanted by right hand drive, which is much preferred. The

clearance of any American car is suitable for the Philippine Islands, evidenced by the large number of low French cars in use for years.

Khaki tops are more serviceable than mohair or other materials, which are almost useless in the rainy season. The khaki tops should be of a good grade waterproof material with the best type of inside-adjusted curtains and equipped with a boot having the lower half made of Pantasote or some material easily cleaned.

Winter Tops Popular for Raining Season

Winter tops are becoming popular for the rainy season from June to November, but manufacturers should make them of some non-rusting material so that the metal will not rust and stain the whole interior upholstering of the top. Few of them have proved tight enough and the continued dampness and humidity of the rainy season results in a sad-looking interior before the rains are half over. There are three good body builders in Manila—and they do a lot of rebuilding.

Rainproof windshields are something which the Philippines have yet to see, excepting only a one-piece windshield used on a 1912 and 1913 model of a big selling car. Extending the top glass below the upper edge of the lower glass was a Godsend to Philippine owners but there are still too many leaks from the manner in which the curtains cover the space between the frame and the supports. The rains are accompanied by driving winds which give the test supreme to the weatherproof qualities of windshields and tops.

The Filipino lives on "discounts" and where he cannot get a discount he wants something extra thrown in and to this end dealers are constantly losing on two items in particular, viz., bumpers and extra tires, which they often have to throw in. Could the manufacturer come to some arrangement whereby all cars would leave the factory so equipped, the dealer standing for part of the extra expense, it would be a big advertising and selling argument.

Finish and Packing Are Important

Many a car has been sold in Manila with a certain amount knocked off because the manufacturer failed to be careful enough with the finish or packed the car so poorly that it arrived with bent fenders, scratched paint or damaged upholstery. Too much attention cannot be given to the finish and then to the packing. The Filipino is a stickler for demanding a "descuenta" (des-quen-ta), or discount, if he finds a pin scratch or anything else wrong in the finish.

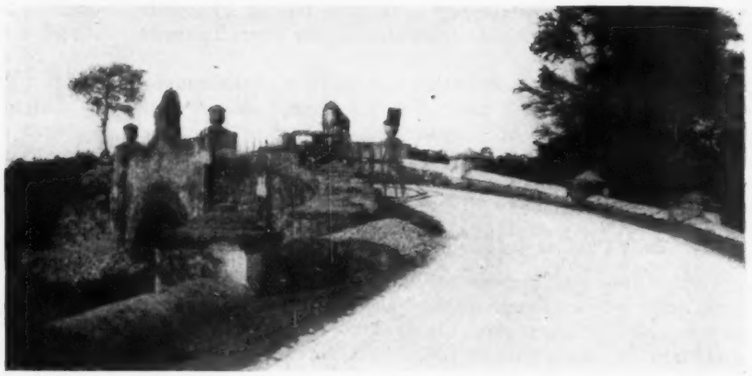
The more passengers a Filipino can get into a car the better he likes it and while the five-passenger car that lists in the U. S. A. for from $800 to $1,000 is the best seller, any car with extra seat equipment that sells around this figure is going to come in for a lion's share of the business. There is a limited market for cars of the $1,500 and $1,800 class. Colors are in great demand after the long siege of dull cars.

Closed Car Market Is Limited

The closed car market in the islands is very limited, although quite a few French landaus, broughams and limousines have been sold in the past. Three or four-passenger coupés are of no use to the dealer. In fact two dealers with six coupés on their hands were forced to rebuild the bodies entirely before the cars could be sold. They were too expensive and few Filipinos care to drive their own cars. Three sedans have been sold but not until after one of them stood in the salesrooms for a year. There is a fairly good market for roadsters with detachable tops and for coupélets. The prices on any of these models must be low. There are at present probably 250 closed cars of different types, most of them in Manila. The other cities offer a poor market for this

Where the Naguilan road from Baguio to the coast joins the lowlands, 18 kilometers of this road being illustrated. In the foreground is the lower half of the Zig-Zag which cannot boast of over 50 ft. of straight road in its 3 kilometers. The entire Naguilan road is 32 miles long; 21 miles of it constitutes mountain section with only one bridge. It follows the ridges all the way to the lowlands. In contrast to this the $3,000,000 Benquet road follows a canyon for 22 miles, until it makes one mighty climb of 1000 ft. in 4 kilometers, up to the famous Zig-Zag, which has astonished world travelers for the past 8 years, and plunges the tired, hot and jaded tourist into the brac'ng pine air of Baguio. This road has over 2000 lineal meters of bridges, wooden truss, steel truss, suspension, and dozens of "half bridges" hanging to the rock cliffs

Magnificent vistas down avenues of stately cocoanut palms form only one of the scenic features of Philippine roads



A typical old Spanish bridge on the Manila North Road. The road surface is typical of the northern section, being surfaced largely with white coral

Concrete kilometer posts made in a river bed where gravel is plentiful. Every kilometer of first class roads in the islands is marked with one of these posts as soon as completed

type of car. The closed car selling season is from June 1 to Oct. 1, and cars should be in hands of dealers not later than May 1.

Five-Passenger Car Best Seller

The big selling car of the Philippines, the low-priced five-passenger touring car, is on the move the year round and although sales during the rainy season last year, June 1 to Nov. 1, were the largest at any time during the history of local business, the best selling season, and the time when dealers should have big stocks, is from Nov. 1 to May 31. Not only in Manila, but all through the islands, these are the best months of the year and in addition they witness the harvesting of the sugar and rice crops which always results in increased sales. It is imperative that dealers have big stocks of cars during these months or else be assured of the arrival of monthly shipments, which is really the best system of handling sales.

Representation in Smaller Cities

Aside from the four cities which we have dealt with so far there are at least ten smaller cities where the Manila dealer should be represented during this period, if not by a regular subdealer, at least by some business house which can own one or more cars and have an eye out for business. Touring is at its height during these months as during the dry season there are miles of third class, or ordinary dirt roads, that can be traveled with comparative ease. There is scarcely a rainstorm between Dec. 15 and May 31. In this period you can plan any trip without thought of rain.

The 1500 miles of first class roads afford the automobile owner and truck owner plenty of opportunity to continue the use of his car or truck in the rainy season, which lasts from the latter part of June to the middle of October, except over such through highways as are broken owing to lack of bridges on the rivers that become raging torrents during July and August. But to show how little traffic is interrupted on some roads during the rainy season, let it be said that trips were made both last year and the year before from Manila to the northernmost town on the northwest coast of the island—400 miles. And in many districts the rainy season has no effect whatever on automobile traffic, particularly in Ambos Camarines, Albay and Leyte (Lay-tay), where the rains are more generally distributed through the entire year.

Time Payments Customary

Ninety per cent of the sales are on time payments. A Filipino with surplus cash in the bank would rather buy a car on time and pay the regular rate of 8 per cent interest on deferred payments than draw his money out of the bank where he is only getting 3 per cent interest. In the first place it is "costumbre," (kos-tom-bray); it has been the custom for 300 years to buy anything from a bicycle to a sugar mill on terms. And again he stands the chance of an opportunity almost any day of loaning his money on Torrens title real estate at 10 or 12 per cent or even more.

From this it will be seen that the Philippine dealer needs capital and plenty of it if he is going to make a success of the automobile business. Several have been forced to quit through lack of capital. The usual terms are one-third down and the balance in 8 months. Trucks are sometimes sold on a smaller initial payment and with a greater number of monthly payments and some unscrupulous dealers have injured not only their own business but that of others by offering cars on no more than 20 per cent down and the balance in from twelve to eighteen monthly payments. The extent of any dealer's business naturally depends upon how much actual cash capital he has or to what extent banks will discount the notes which he

has taken in and endorsed. It can be said, however, that most of the Manila dealers are solid financially, there being one in particular who sells about 50 per cent of the cars sold in Manila and who never appears to be short of capital. The next largest dealer was, until about a year ago, financed by a prominent New York export house but he has since secured the support of one of the Manila banks, thus doing away with the commission he was paying the New York house and now buys direct from U. S. A. factories which is the preferred plan for Philippine dealers.

Surprisingly Few Losses

It is surprising how few losses there are in the Philippine method of handling car sales. The purchaser signs a separate note for each deferred payment, these notes bearing interest at 8 per cent and showing that the title of the car remains with the seller until the last note is paid, that the car may be taken back and sold for balance due upon default of any payment and the purchaser to stand the usual fees, 10 per cent in the event of the note being placed in an attorney's hands. If the dealer is doubtful of the standing of his customer a formal mortgage is drawn up.

Large Capital Required

It is the large amount of capital required to finance these time sales that is responsible for the comparatively small number of important dealers in the Philippines, there being only three of any great consequence. There is room in Manila to-day for one or two more big automobile houses, or several smaller dealers. A well established concern with plenty of capital carrying tires and accessories and having a repair shop could do a business of not less than $300,000 a year. There is a nice opening for several small dealers in Manila and the southern cities with one or two good cars and a line of tires.

Viewed from the Far Eastern standpoint, Manila dealers are decidedly progressive and wide-awake, and from a U. S. A. standpoint they are quite up-to-date in several ways, yet they lack organization and when it comes to co-operation they could not be farther apart. They are big advertisers—most of them—and snap up nearly every chance of a publicity campaign, one of them, through the clever advertising and forceful publicity of an aggressive young American, having pushed the Hupmobile to the head of the list of Philippine Islands cars. Their agency includes nearly a dozen cars, Hudson, Hupmobile, Peerless, Federal truck, Denby truck, Dodge, Jeffery, Scripps-Booth and Oakland. In addition to this is a line of European cars consisting of Fiat, Panhard, Renault, Delahaye and Brasier.

The Philippines' second largest dealer, handling Overland, White and Saxon, has an establishment which for completeness rivals some of the largest agencies in the U. S. A. The company has a two-story concrete building covering an entire block, built especially for the purpose, with modern salesroom, offices, shops, body works, vulcanizing and charging plants, etc.

Manila's largest dealer has an immense salesroom which can accommodate about twenty-five cars and usually does, thus sacrificing everything in the way of possible good display. This is something that is unknown in Manila. The dealers carry large stocks and instead of acquiring extra storage space they cram salesrooms so full of cars that it is often impossible to walk between them.

(*To be continued*)

A Punctureproof Tire Wheel

(*Continued from page* 461)

tirely shrouded with metal and the appearance of the trial equipment suggests that the light solid tire which is used outside the rim will require renewal long before the air tube, although the solid tire as used on the Ford seems to be subject to comparatively little wear. Arrangements have not yet been completed for placing this wheel on the market, but the experimental wheel shown in the illustration is being modified slightly to put it into the best shape for manufacturing and it is intended to have the wheels on the market before long. The appearance of the wheel is not at all unpleasing since the tire equipment is so little larger than the ordinary tire that it does not give any impression of great weight or massiveness.

Nothing could be more representative of Baguio's beautiful drives than this picture taken on what is known as South Drive. All of Baguio's 30 miles of streets and drives are built with a heavy crushed rock foundation and surfaced with fine limestone that turns them into practically cement roads after a few rains and sufficient rolling

Industrial Miscellany

Factory

Hess-Bright Mfg. Co., Philadelphia, is having plans drawn for an addition.

Hall-Scott Motor Car Co., Berkeley, Cal., is planning a two-story factory on 5th and Snyder Streets.

Jamestown Auto Parts Mfg. Co., Jamestown, N. Y., is taking bids on a two-story factory, 80 by 1207 ft., of brick and steel.

Precision Tool & Machine Co., Newark, N. J., has leased a section of the Morris Building on Scott Street for the manufacture of its specialties.

John Redmond and A. Hanshaw, Detroit, will establish a factory at Lapeer, Mich., to manufacture steel axles and wagon tongues.

J. P. Gordon Co., Columbus, Ohio, will add to its plant. It will take over the G-M service station which has occupied one of the Gordon factory buildings. One hundred new power sewing machines and operators have been added to the factory, which now employs regularly between 650 and 700 in the manufacture of fabric specialties for automobiles, such as seat covers, tire covers and engine robes.

Van Dorn & Dutton Co., Cleveland, has moved into its new plant at the east end of the city. The main factory building is in two sections, one section two stories high, 50 by 250, and the other one story, 80 by 250. At the rear is a large substory room used for storage. Another building, 60 by 75, is used for hardening and heat treatment. The plant was designed for efficiency, and all products are routed through from one end to the other.

Sexton Oil Co., Chicago, will establish factory branches in ten trade centers. Probably these will include Boston, Cleveland, New York, Albany, Omaha, Memphis, Los Angeles, Charleston and Savannah.

The Columbia Axle Co., Cleveland, has added 100 workmen to its factory force. The company expects to turn out 30,000 axles in 1917. This is twice the Columbia production during last year.

Racine Mfg. Co., Racine, Wis., making bodies, has been obliged to place its factory on a regular night shift to handle the large volume of orders for taxicab and other special bodies now being booked. The output has been increased to eighty touring car bodies and fifteen closed bodies daily. At this time the concern is working on a renewal order for seventy-five taxicab bodies for the Walden W. Shaw Livery Co., Chicago and New York. The company also is licensed to manufacture Springfield closed bodies. It has been found necessary to eliminate all custom work in order to accommodate the demands of the regular contracting customers.

Arc Auto Heating Co., Columbus, incorporated recently, has a plant in operation at Reynoldsburg, near Columbus. The company makes heaters for all makes of cars. G. J. Wahlenmaier is president, and K. E. Strain, secretary-treasurer. The company's offices are at 582 North High Street.

Commerce Motor Car Co., Detroit, has moved its offices to the newly completed general office section of its factory.

Frank Bros. Iron & Metal Co., Detroit, have purchased the land, buildings and equipment of the defunct Victor Manufacturing Co., of Detroit, automobile body builders. The building has a floor space of 38,000 sq. ft., and includes a power plant and dry kilns.

Federal Rubber employees at Milwaukee gave their annual minstrel show and entertainment at the Pabst Theatre in Milwaukee, Feb. 24. Fifty employees took part in the various vaudeville and cabaret sketches. The profit realized from the benefit will be used to replenish the treasury of the employes' mutual welfare society.

Appleton Auto Body Co., Appleton, Wis., organized several months ago to manufacture all kinds and types of car and truck bodies, already has been obliged to increase its capacity. The company has purchased the factory group at Fremont and Jefferson Streets, which now is being rebuilt into a modern body-making and finishing shop.

Ford Motor Co., Detroit, is installing two huge turbine engines, each with a capacity of 75,000 hp., in its new plant at Delray, a town close to Detroit.

McFarland-Westmont Tractor Co., formerly of Lodi, Wis., has begun the manufacture of all-steel tractors in its permanent works at Sauk City, Wis. The company occupies the plant erected for the Shaw Motor Co., Chicago, but never occupied.

Richardson-Phenix Co., Milwaukee, lubricating engineer and manufacturer of lubricating devices, has opened a sales office in the Builders' Exchange, Cleveland, O., in charge of W. J. Oettinger. The office will handle the engineering details of all problems connected with the scientific lubrication of machinery and the installation of systems for circulating, filtering and sterilizing cutting oils.

The Automobile Calendar

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1917

April—Los Angeles to Salt Lake City Road Race.
May 19—New York Metropolitan Race on Sheepshead Bay Speedway.
May 30—Indianapolis Speedway Race, Championship.
June 9—Chicago, Ill., Speedway Race, Championship.
June 23 — Cincinnati, Ohio, Speedway Race.
July 4—Omaha, Neb., Speedway Race, Championship.
July 4—Tacoma, Wash., Speedway Race, Championship.
July 14 — Des Moines, Iowa, Speedway Race, Championship.
Aug. 4—Kansas City Speedway Race.
Sept. 3—Cincinnati, Ohio, Speedway Race, Championship.
Sept. 15 — Providence, R. I., Speedway Race, Championship.
Sept. 29—New York, Speedway Race, Championship.
Oct. 6—Kansas City Speedway Race.
Oct. 13 — Chicago, Speedway Race.
Oct. 27—New York Speedway Race.

SHOWS

Feb. 24-March 3—Newark, N. J., Show, Palace Ballroom.
Feb. 24-March 3 — Brooklyn, Show, 23rd Regiment Armory.
Feb. 24—March 3—Atlanta, Ga., Automobile Dealers' Assn., Auditorium.
Feb. 26-March 3—Great Falls, Mont.
Feb. 26-March 3—Omaha, Neb., Show, Auditorium, Omaha Automobile Show Assn.
Feb. 26-March 3—Utica, N. Y., Utica Automobile Dealers' Assn., State Armory.
Feb. 26-March 3—Wilkes-Barre, Pa., Hugh B. Andrews, Mgr.
Feb. 27-March 4—Atlanta, Ga., Show, Auditorium, Atlanta Show Trades and Accessory Assn.
March 1, 2, 3 — Urbana, Ill., Show, Automobile Trade Assn. of Champaign Co., Armory of the University of Ill.
March 3, 4, 5—Green Bay, Wis., Show, Green Bay Automobile Dealers' Assn.
March 3-10 — Boston, Mass., Show, Mechanics' Bldg., Boston Automobile Dealers' Assn.
March 3-10—Washington, D. C., Middle Atlantic Motor Assn., Inc., Union Bldg.
March 5-10 — Brooklyn, Truck Show, 23rd Regiment Armory.
March 5-10—Jamestown, N. Y., Jamestown Automobile Dealers' Assn., Armory. C. A. Hanvey, Mgr.
March 5-12—Birmingham, Ala., Auditorium.
March 6-9—Fargo, N. D. A. Hanson, Mgr.
March 6-10—Fort Dodge, Iowa, Northern Iowa Show, New Terminal Warehouse, G. W. Tremain, Secretary.
March 7-10 — St. Joseph, Mo., Auditorium, St. Joseph Automobile Show Assn.
March 10-17—Zanesville, Ohio, Muskegon Motor Club.
March 12-14—Fort Worth, Tex., Fat Stock Show, Coliseum.
March 12-17—Vancouver, B. C., British Columbia Automobile Assn., Horse Show Bldg.
March 13-16 — Fargo, N. D., Armory and Auditorium.
March 14-17—Mason City, Ia., Armory, Mason City Automobile Dealers.
March 14-17—Davenport, Iowa, Show, Coliseum Bldg., Tri-City Auto. Trade.
March 17-21—Manitowoc, Wis., F. C. Borcherdt, Jr., Mgr.
March 17 - 22 — New Haven, Conn., Show, Hotel Taft.
March 17-24 — Pittsburgh, Pa., Motor Square Garden. J. J. Bell, Mgr. Automobile Dealers' Assn. of Pittsburgh.
March 18-23—Cedar Rapids, Ia., Cedar Rapids Automobile Trades Assn.
March 19—Paterson, N. J., Sixth Annual, Auditorium. R. A. Mitchell, Mgr.
March 20-25—Denver, Col., Mammoth Rink, H. F. Blackwell, Promoter.
March 21—Trenton, N. J., Second Regiment Armory. J. L. Brock, Mgr.
March 27-31—Deadwood, S. D., Fifth Annual, Deadwood Auto Show. J. E. Nelson, Mgr.
March 31-Apr. 14—Atlantic City, Garden Pier. S. W. Megill, Mgr.
April—Milwaukee, Wis., Spring Show, Milwaukee Automobile Dealers.
April—Calumet, Mich., Show, Coliseum. Frank Ketchell, Mgr.
April 4-7—Stockton, Cal., Second Annual San Joaquin Auto Trades Assn. Samuel S. Cohn, Mgr.
Sept. 2-9—Spokane, Wash., Interstate Fair.
Sept. 9-15 — Milwaukee Show, State Park Fair, West Allis.
Sept. 9-15 — Milwaukee, Wis., Fall Show, Wisconsin State Fair, West Allis, Milwaukee Automobile Dealers.